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Contractors and Engineers Monthly

Vol. 44, No. 4 APRIL, 1947 $3 a Year, 25 Cents a Copy

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Covering the Field

Highway Patching
A pre-mixed patch, painstakingly applied, sets high standards of maintenance on black-top roads. See this page.

Convention Reports
The ARBA (page 1) and the North Atlantic Highway Officials (page 13) elect officers and adopt new policy resolutions.
Future earth-moving equipment is among topics discussed at 8th Annual Utah Highway Engineering Conference (page 81).

Concrete Overpass
A truck crane handled pours for the new Wilbur Cross Parkway overpass whose construction is detailed on page 1.

Driving Vehicular Tunnel
Twin tunnels driven through rock under New York's East River to carry Manhattan-Brooklyn traffic are described on page 2.

Irrigation-Canal Project
Special equipment and safe practices characterize the Friant-Kern Canal mechanical trimming and lining job for 37 miles. See text on page 6 and pix on pages 46-47.

Highway Grading
A new bridge approach was short but required heavy rock excavation. See page 18.

So did a one-mile contract to eliminate sharp reverse curves and short vertical sight distances. See page 61.

Mixer Lays Base Course
As told on page 23, a traveling plant mixed aggregate and clay binder for 7.9 miles of stabilized base course.

Bituminous Paving
Page 30's article describes the construction of a 26-foot asphalt pavement 8.6 miles long to by-pass heavy traffic.

Concrete Pipe Line
An elaborate access-road system expedited laying 21 miles of reinforced-concrete aqueduct pipe through mountains. Page 37.

County Road Work
Bids too high. We'll widen and resurface the road ourselves on a contract basis, says one Michigan county on page 45.
Who said meat shortage? What cattle trucks do to county roads is described on page 69.

Concrete Paving
Described on page 49 is one of five contracts to widen to eight lanes 3 miles of the most heavily traveled U. S. highway.

Dam Site Studied
The geological study and core drilling necessitated at Hungry Horse Dam, soon to rise in Montana, are covered on page 57.

Roadside Development
A summary of the roadside problems discussed at Ohio's Sixth Annual Short Course appears on page 65.

Road Tests Evaluated
Discover on page 87 which of seven experimental subgrade treatments proved most effective under concrete paving.

(You will find "In This Issue" on page 4)

Pre-Mixed Patch Used With Success

Mixture of Crushed Rock, Rock-Asphalt Dust, and Road Oil Carefully Controlled; Outlasts Original Surface

✦ A NEW pre-mixed patch material capable of making a good highway better has been developed and tried successfully for six years by the Texas State Highway Department. Composed of crushed-rock aggregate, fine rock-asphalt dust, and road oil, patches put on will last as long as the highway and ride perfectly smooth at 60 miles an hour.

The material was developed under the supervision of R. E. Killmer, who was District Engineer at Pecos District 6 at the time. All experimental work was conducted through the untiring effort of Maintenance Superintendent Elston Arbuckle. The basic formula which they developed is setting a high standard of maintenance on black-top roads under the joint supervision of District Engineer T. J. Kelly and District Maintenance Engineer R. H. Spiller, who have taken over at Pecos since the patch was developed.

The urgent need for a good patch has been evident in western Texas for many years. Roads there are generally straight for miles, and traffic moves at high speed. Winter snows falling on the caliche shoulders are sometimes partly absorbed before snow plows can blade the offending moisture away. Bituminous riding surfaces start to ravel at the edges, or settle perceptibly in certain sections.

Thus was born the need for a dense, tough, smooth-riding patch strong enough to resist vehicular impact. Furthermore, it had to be workable enough to make a feather edge. District 6 operates under the hard-boiled theory that any patched road should be smoother than a new highway. For unless patches are smooth, they can cause enough vehicular impact on the far side of the repair work to start another failure.

With that in mind, Killmer and Arbuckle experimented until they developed the material now in use. As a

(Continued on page 83)

C. & E. M. Photo
After mixing in a Ransome 27-E paver, concrete for the new Wilbur Cross Parkway grade separation near Meriden, Conn., was swung over the forms and poured by a Lorain truck crane.

ARBA Convention Held at Chicago

Over 1,775 Attend; Hear Road-Building Problems Of 1947 Discussed; Adopt New Policy Resolutions

✦ HIGHWAY transportation within the United States faces in 1947 perhaps the most crucial year of its life, delegates to the 44th Annual Convention of the American Road Builders' Association were told in Chicago in February.

Road builders from the United States and several foreign lands heard H. E. Hilts, reading a paper for Commissioner of Public Roads Thomas H. MacDonald, say: "The enormous volumes of traffic crowding our main rural roads and city streets reflect more accurately than any other index the demand for adequate highway facilities to accommodate the traveling public."

Mr. MacDonald's paper pointed out that travel on rural roads and urban thoroughfares in 1946, the first post-war year, rose to an all-time high of 334,000,000,000 vehicle-miles. This record exceeds the pre-war peak year by 1,000,000,000 vehicle-miles.

Paul Cunningham, Member of the

(Continued on page 77)

Texas State Highway Dept. Photo
In pre-mixing patch material in Texas, workmen wheelbarrow crushed-rock aggregate into the skip of the portable mixer. Then RO-3 road oil is fed gradually into the "beater" chamber at 200 degrees F, and the rock asphalt added. Stockpiling for a period of from two to six months is recommended.

New Concrete Span Built Over Parkway

Twin Rigid-Frame Bridge Built on Gravel Stratum; Concrete Pours Handled By Truck Crane

✦ EVERY grade separation that is constructed on the Wilbur Cross Parkway in Connecticut marks another step towards its completion. Eventually this new stretch of 4-lane divided highway will continue from the end of the Merritt Parkway around New Haven and on northwards to the capital at Hartford.

Where the line of the new parkway passes to the east of Meriden and U. S. 5, six bridges were constructed last season for the Connecticut State Highway Department—one at Westfield Road and another over a single-track railroad, built by the M. A. Gammino Construction Co. of Providence, R. I.; two more at Miller Avenue and Paddock Avenue by D. Arrigoni of Middletown, Conn.; and two by Arute Bros. Inc., of New Britain, Conn., at East Main Street and at Baldwin Avenue. The latter, a reinforced-concrete twin rigid-frame structure, was started April 1, 1946, and was completed by the end of August at a cost of $89,300.79.

Included in this contract was a double 8 x 6-foot reinforced-concrete culvert, 112 feet long. It was built just east of the grade separation to carry Harbor Brook, which meanders back and forth along the new route of the parkway. It will carry a 20-foot fill on its 1-foot 1-inch roof slab. And it has 12-inch side walls and a floor 1 foot 3 inches thick.

The grade separation is built on a 6-degree 21-minute skew. It carries Baldwin Avenue over the parkway on two 42-foot spans, having a minimum vertical clearance of 14 feet ½ inch. From the bottom of the substructure footings to the spring line of the arch the distance is 29 feet. The center pier of the bridge separates the two directions of traffic on the parkway and is 36 feet long x 11 feet wide. The abutments are the same length and taper from a width of 2 feet 3 inches at the bottom to 3 feet at the top.

From the face of each abutment, two wing walls extend back at right angles to contain the approach fills on Baldwin Avenue. The wings are from 31 to 34 feet long, and are 4 feet 6 inches wide at the bottom and 2 feet 8 inches at the top. The structure is designed for H-20 loading.

Form Work

Excavation was required for the bridge footings, and for the diversion channel dug for Harbor Brook so that the culvert floor could be poured in the dry. It was done by a Bucyrus-Erie 2-yard shovel. Any additional necessary trimming to neat lines was done with an Owen ¾-yard digging clamshell bucket on the 45-foot boom of a Bucy-

(Continued on page 73)

Twin Tunnels Boring Under River in N. Y.

Vehicular Tubes Beneath East River Will Connect Manhattan and Brooklyn; Mason & Hanger Contract

By WILLIAM H. QUIRK,
Eastern Editor

✦ WORKING at depths as great as 125 feet below mean high water in the East River, two contractors are driving twin vehicular tunnels from the Battery, Manhattan, and from Hamilton Avenue, Brooklyn. Their juncture is scheduled for around the middle of the summer. The 9,117-foot tubes, portal to portal length, will be the longest underwater tunnels in the country, and each will carry two lanes of traffic.

Known as the Brooklyn-Battery Tunnel, this great underwater project is being constructed by the Triborough Bridge and Tunnel Authority. Mason & Hanger Co., Inc., is working on the river tunnels from the southern tip of Manhattan Island; the George H. Flinn Corp. is proceeding from the Brooklyn side. Both contractors are from New York City and have had many years' experience in this type of heavy construction.

The direction of the tunnel is nearly due north and south. The east tube will carry the northbound, and the west tube the southbound traffic. Lined with cast-iron rings, the circular tubes have a 31-foot outside diameter and are laid at least 45 feet apart on centers. They will be connected at two points by small cross passages. Over the fresh-air duct in the bottom of the tunnel, traffic will be carried on a 21-foot 4-inch roadway; this will have a vertical clearance of 13 feet 6 inches to the exhaust-air duct overhead.

The maximum downgrade in the tunnel is 4 per cent near the Manhattan end; it decreases to 0.7 per cent until the ventilation shaft at Governors Island is reached. The Brooklyn street level is attained by easy grades, for the maximum upgrade in the tunnel is 3.7 per cent.

From the Brooklyn side the bulk of the boring has been through a mixture of hardpan, clay, silt, and mixed face. This has required the use of a shield and compressed air over 75 per cent of the 3,700-foot contract, which extends from the construction shaft near the foot of Hamilton Avenue to a point east of Governors Island. Near the north end of the contract this glacial till under the riverbed gives way to rock, and for about the last 1,000 feet the tunnel can be dug in free air.

From the construction shaft in Battery Park on the other contract to the juncture near Governors Island, the twin tubes are being constructed mostly through rock, known as Manhattan schist. The exception is one point about 400 feet from the shaft where a deep gorge, now filled with silt, had cut through the rock. Compressed air was required when driving a bottom drift through this section, about 70 feet long. Otherwise the Manhattan contract is being worked in free air.

Halted by War

Financed by a loan from the Reconstruction Finance Corp., the project got under way back in October, 1940. But it was suspended because of the war in December, 1942. Work was resumed in November, 1945, when war restrictions were removed. However, before work was suspended, Mason & Hanger Co., Inc., working from the Manhattan side had driven a 24 x 24-foot pilot tunnel by the bottom-heading method for 2,800 feet of its 4,000-foot tunnel section.

A small jumbo carrying 8 to 10 drifter drills was used in the excavation. An average round consisted of 80 holes with a depth of around 10 feet. The cut holes at the center were drilled with 12-foot steel; they were filled with powder set off by instantaneous charges and were rimmed with about 15 holes, also charged full, using No. 1 delays. The other holes were only two-thirds full and were set off by delays ranging from No. 2's up to No. 9's which were

C. & E. M. Photo

This Conway mucker, one of four used on the Manhattan contract for the Brooklyn-Battery Tunnel, receives its daily greasing with an Alemite grease gun. It is being held in reserve on a spur track.

the lifters, at the bottom of the tunnel. By thus drilling the pilot tunnel, space was provided to start the slabbing-down operations later. An advance of 8 to 9 feet was secured with each blast.

When the soft ground in the rock gorge was reached, the tunnels were put under 17 pounds of air pressure and a small bottom drift was dug through on each side until hard rock was reached. The drifts were lined with concrete on the wall side and a roof of steel beams was erected. The core between was then excavated and a temporary roof of steel and concrete was extended over this portion of the pilot tunnel and continued forward to the rock section where it was no longer needed. The pilot tunnel was continued in free air.

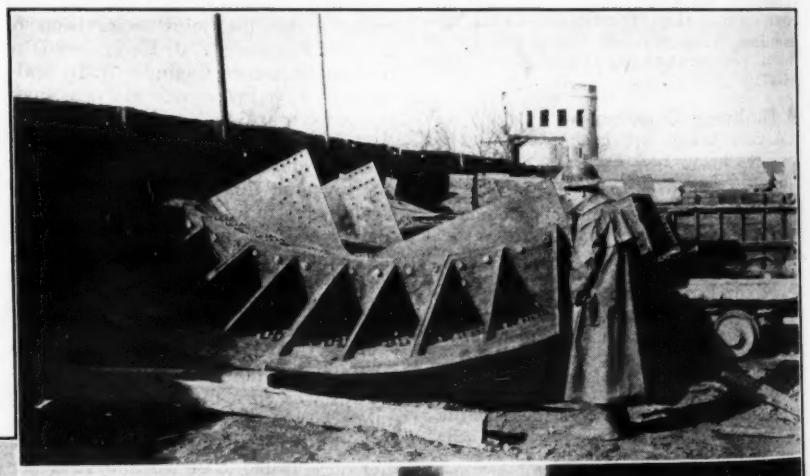
When work was resumed in 1945, the contractor completed the bottom drifts in each tunnel to the contract limit. The invert was trimmed down to grade with jackhammers, and a 15-foot-wide concrete cradle was laid from 9 to 24 inches thick, depending on the profile excavation. Truck-mixed concrete was used. It was dropped down the shaft through a 12-inch pipe into 1-yard side-dump cars which were then run out on a temporary track in the center of the tunnel. Later on when the shield is used for trimming the tunnel roof and installing the cast-iron rings, the concrete invert will enable the shield to be shoved smoothly ahead.

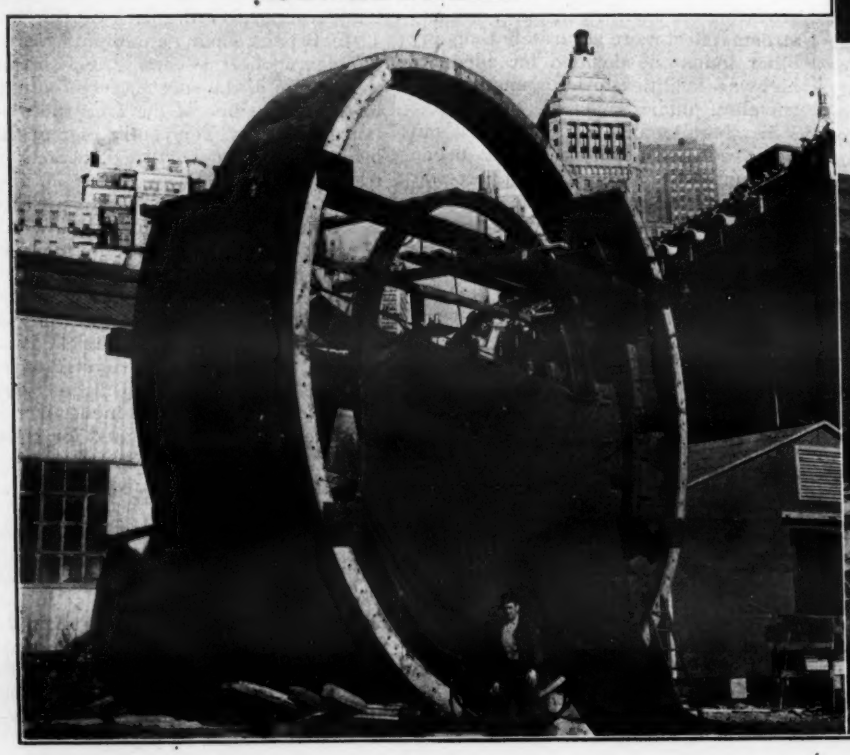
A 36-inch-gage track was laid down the center of the invert and secured in place with steel ties and pins; the latter were embedded in the rock below the concrete. With the invert completed and the supply track in readiness, a larger drill carriage was constructed for the enlargement of the tunnel. This carriage rides on rails laid on benches on each side of the invert where it flattens out and extends into the rock.

Three Operations

Mason & Hanger planned the construction of its tunnels in three opera-

(*Continued on page 25*)





At right is the top segment of the steel-plate shield Mason & Hanger will assemble and move south through the Brooklyn-Battery Tunnel while the cast-iron lining is set in place and the roof is trimmed under the shelter of the 4½-foot hood, which is shown here resting on timber blocks. Below, left, is a portion of the 31-foot-diameter cast-iron lining assembled outside of the tunnel. Three rings, each made up of 14 segments and a key, have been bolted together for a portion of the assembly to test a new type of pneumatic bolt-tightening machine shown in operation below, right. Developed by the contractor and the Triborough Bridge and Tunnel Authority, and driven by an Ingersoll-Rand air-driven motor, these machines can work five at a time to tighten the 160 bolts on each ring in from 20 to 30 minutes.

Laying 3½ miles of two-course Texaco Asphaltic Concrete pavement through the center of Bangor, Maine

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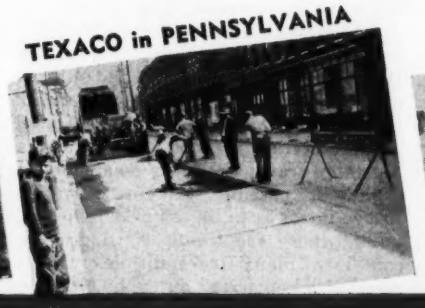
TEXACO in PENNSYLVANIA



TEXACO in VIRGINIA

TEXACO in ILLINOIS

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TEXACO in KENTUCKY

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THE NATIONAL BUSINESS PAPER FOR CIVIL ENGINEERING CONTRACTORS AND HIGHWAY ENGINEERS AND COMMISSIONERS

Member of Controlled Circulation Audit

Issued Monthly by Buttenheim-Dix Publishing Corp.

Editorial and Business Office: 470 Fourth Ave., New York 16, N. Y.

Acceptance under the Act of June 5, 1934, at Mount Morris, Illinois, authorized March 26, 1945.

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Daily News Bldg., Chicago 6, Ill. — Duncan A. Scott & Co., Mills Bldg., San Francisco 4, Calif. — 2275 Wilshire Blvd., Los Angeles 5, Calif.

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Competition—Merit and a Low Bid

In the west, recently, an established contractor had irrigation work fairly well "sewed up". He had developed and built special machines to dig lateral canals, place concrete lining, and do the host of other odd jobs around a reclamation project. For several years his firm was the low bidder on all important work in that area.

And yet, when the bids were opened on the latest job, this contractor found himself underbid. Competition and imagination had sharpened another man's pencil. Someone else, perhaps with an even better idea, was willing to gamble his capital on doing the same work cheaper. Another contractor had said, in effect, "For a certain amount of public money, I believe that I can do more work."

He had backed up that belief with the low bid.

This is a perfect example of the contract system in action, and the contractor who was displaced by the low bid was the first to congratulate the newcomer. Under this system nothing matters except merit and a low bid. That is one more reason why contractors, public officials, and Government department heads alike must stand on constant guard to preserve it.

Contractor-Engineer Cooperation

The necessity of better liaison between contractors and engineers was stressed by Harry J. Kirk, Division Manager, in his report to the Highway Division of the Associated General Contractors, at its 28th Annual Convention. Such liaison is the objective of the Joint Cooperative Committee of the American Association of State Highway Officials and the AGC. It seeks to effect a healthy face-to-face exchange of views and a frank discussion of the problems of each group. Out of this exchange and discussion, it looks for greater progress towards a solution of many problems and difficulties which beset the construction industry.

One such problem, indeed pressing, is that of getting the most out of every construction dollar spent. With costs mounting steadily, construction appropriations once thought adequate no longer produce the results contemplated. In the highway field, for example, the cost per mile of highway is such that fewer miles can be constructed with a given sum of money. The reason for this is two-fold: higher labor and materials costs plus the uncertainties of supply and the general rise in overhead expenses; and the higher standards of design and construction to provide high-type roads to meet modern traffic conditions.

Greater cooperation between contractors and engineers can combat these rising construction costs, Mr. Kirk pointed out. Their working together can (1) eliminate certain refinements insofar as contractors cooperate by satisfactory work; (2) mean that specification writers outline such tolerances as can be obtained by the use of machinery only and without expensive hand labor; (3) lead to more intensive study on the state and local level of ways and means to conserve the highway dollar. Facing such problems and working together in their solution should make for greater economy in the expenditure of public funds and a greater contribution to the national welfare.

All too frequently it is a case of contractors *versus* engineers rather than contractors *and* engineers working together for a common goal. Cooperation, mutual understanding, and tolerance are needed not only in solving the international problems which confront our United Nations; they are equally essential in solving the every-day problems within our industry.

The Army has a peacetime job too. The Corps of Engineers civil-works program, the Army Map Service, and other Regular Army branches offer volunteers an opportunity for service as well as personal training.

Flood Control Needs Ample Storage Space

River and flood control was one of the subjects discussed at the recent annual meeting of the American Society of Civil Engineers. Among the speakers was Albert L. Cochran, who heads the Reservoir Regulation and Hydrology Branch of the Office of Chief of Engineers, U. S. A.

He compared the problem of combining flood control with other water-control functions—navigation, irrigation, power, conservation—to that of moving in with relatives. "If the house is large enough and located satisfactorily with respect to your place of business, the arrangement may prove to be of great practical and economic advantage", he said. And, in some cases, the action may be necessary.

Mr. Cochran stressed, however, that the requirements for satisfactory storage capacity to control maximum floods cannot be changed, even if this multiple-purpose use is essential. And sufficient volume must be maintained.

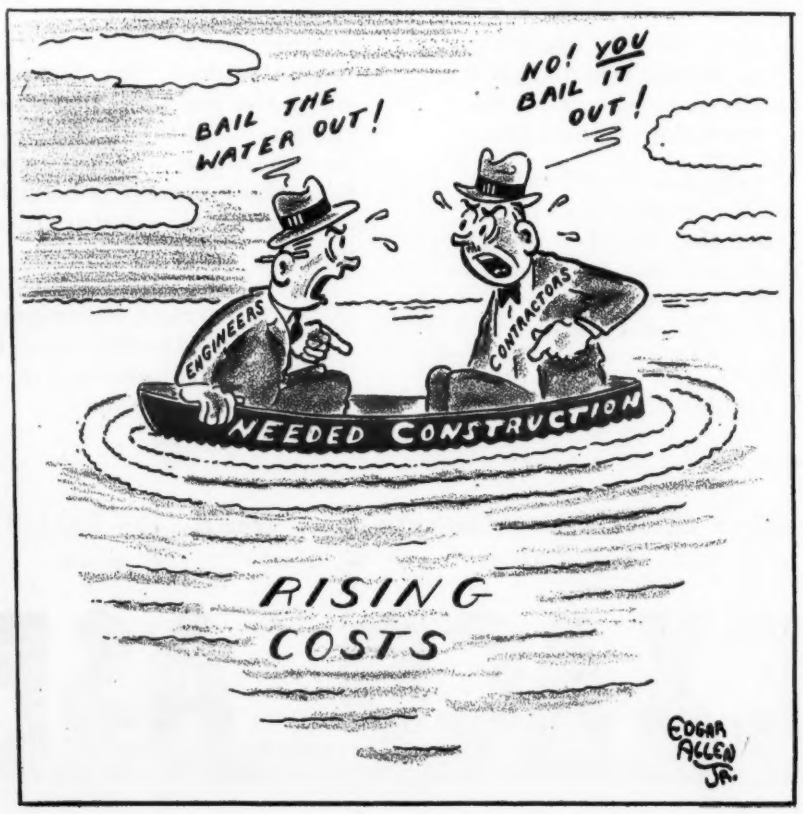
Malcolm Elliott, retired Corps of Engineers Colonel, also discussed this subject of multiple-purpose reservoirs.

Inasmuch as storage space is designed for the unusual condition, he said, it may remain vacant and unused for many years; consequently, there is a great temptation to use it for other purposes than that for which it is intended. But it cannot be so diverted and still remain available for flood protection. Once the storage space has been filled in decapitating a flood, the reservoir must be drawn down as soon and as rapidly as possible if security against future floods is to be assured. Only by taking these facts into consideration, can any plan for multiple-purpose reservoirs be carried out.

Nicholls W. Bowden, Chief of the River Control Section, Tennessee Valley Authority, told the meeting that the flow of the Tennessee River is scheduled daily, and often several days in advance. This is accomplished by centralized control at the chief engineer's office, where complete hydrologic data are received, assembled, and interpreted; run-off estimated; flows routed; and operations decided upon by engineers thoroughly familiar with system characteristics.

Mr. Bowden pointed out that since the first reservoir became available on the Tennessee River, there have been 14 floods which would have exceeded flood stage at Chattanooga had not this storage space been available.

GET TOGETHER AND DO IT, BOYS!



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Film on Boulder Dam Now Being Prepared

Boulder Dam and its contribution to the basic economy of the southwest will be featured in a forthcoming film. It is being prepared under the supervision of the State Department for release to foreign countries, the Bureau of Reclamation recently announced.

The firm of Simmel-Meservy of Hollywood was commissioned by the State Department to prepare the film. Robert Joseph of that firm is now on reconnaissance of the entire lower basin to secure data to be used in the picture.

The film will depict the uses to which Colorado River waters are being put, and will show how reclamation has benefited the southwestern region. All the important features will be shown: irrigation, domestic water usage, hydroelectric power generation serving industry, and the manner in which the lower Colorado is now protected from annual-flood destruction.

It was revealed also that the State Department is showing several similar educational films in foreign lands, in order better to acquaint the people of the world with the American form of government and the American way of life. Considered an outstanding film of this nature is one dealing with the TVA.

Mr. Joseph, who is to prepare the shooting script, has had wide experience in motion-picture writing. With four years of service abroad during World War II, he has some knowledge of his European audience. Since the end of the war he has been connected with the Office of Information and Cultural Affairs of the State Department.

It was learned that the film will require approximately eight months to produce.

Latin American Engineers Conclude Studies in U. S.

A year of study for Latin American engineers attending the Inter-American Highway Engineering Conference was concluded on March 7 with a reception in Washington. The course was sponsored by the American Road Builders' Association with the cooperation of the Department of State, the Office of Inter-American Affairs, the Public Roads Administration, and the Pan American Highway Confederation.

The engineers, representing sixteen Central and South American republics and Mexico, have been on assignment with state and county highway departments and equipment manufacturers since last summer.

In February they attended a 4-day highway-traffic course at Yale University. It was devoted to an analysis of traffic regulations, characteristics, control, planning, etc. The study program concluded in Washington with sessions on airport design and a two-day course on city planning.

Blending BINDER AND AGGREGATE IRREGULARITIES by CROSS-MIXING WITH THE SEAMAN MIXER

WHEN aggregates vary,—as often occurs load by load, in pit run material and the fines and the coarse lie some distance apart . . . when, due to accidents in applying bitumen uniformly . . . when, even with uniform binder application the fines absorb more and the coarse material less,—all these irregularities are easily corrected by cross-mixing with the SEAMAN. Cross-mixing simply means operating the SEAMAN MIXER in zig-zag or crosswise as well as in the longitudinal directions. Due to the "carry" of materials within the hood of the SEAMAN, coarse material is then mixed uniformly with the fines and "rich" and "lean" spots in binder application are successfully blended. Furthermore, shut-downs because of excess moisture in the materials are greatly shortened when the SEAMAN is used,—for its inherent aerating action does a quick job of dehydrating. And in a bituminous mix,—the oxidation of solvents "sets" the treatment faster. What mixing equipment other than the SEAMAN offers such great versatility in economical operation?

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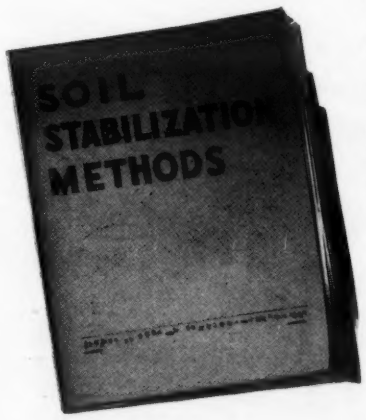

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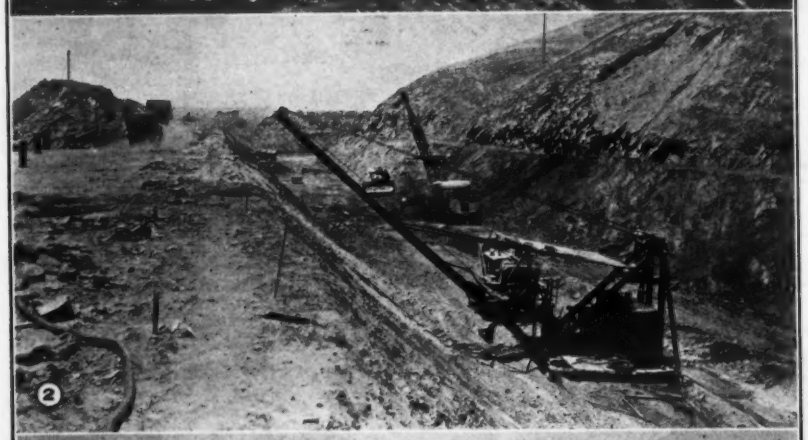

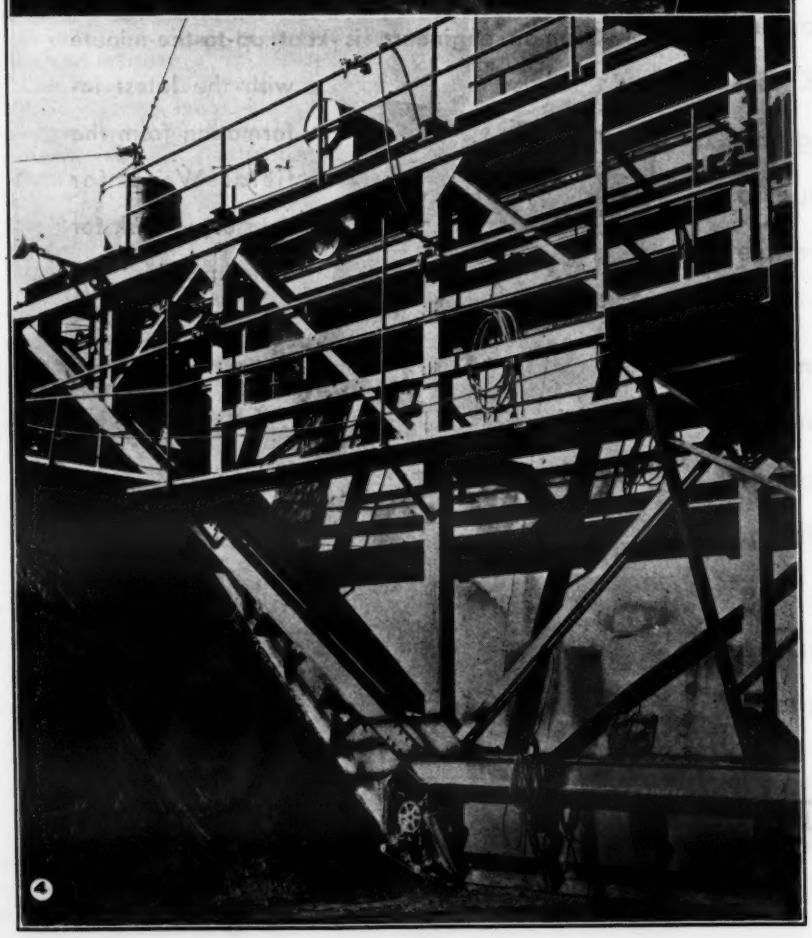

Special Equipment Sets Canal Record

Biggest Man-Made Stream Ever Trimmed and Lined Mechanically Is Now Under Way in Central Valley

By RAYMOND P. DAY,
Western Editor

(*Photos on pages 46 and 47*)

✦ THE biggest irrigation canal in the United States ever to be trimmed and lined by mechanical equipment is now well started in California's Central Valley. It is designed for a carrying capacity of 4,000 cfs, with enough freeboard to handle 5,000 cfs that will be diverted through it in years to come. This man-made river is being trimmed to line and poured throughout its length by machines built especially for the job.

The $6,500,000 contract with the U. S. Bureau of Reclamation will advance the Friant-Kern Canal system to a point about 37 miles south of Friant Dam. It is the first leg of the 160-mile Friant-Kern irrigation canal, which eventually will end west of Bakersfield.

This canal contract, in fact the canal itself, is only a small part of the comprehensive Central Valley development project. Ultimately water from Friant Reservoir will feed thousands of thirsty acres through the new canal. But it cannot be more than just a plan until other contracts on the Delta-Mendota Canal and pumping station distribute Sacramento River water to the Mendota irrigation pool, supplied at present from the Friant Dam outlet. There is not enough water in the Friant Reservoir to handle both irrigation jobs.

That is a single example of the enormity of the project as a whole. The overall program is geared to distribute the widely diversified rainfall in the great valley. This ranges from a normal precipitation of 100 inches annually at Shasta Dam, which stores the Sacramento in the far north, to 7 inches at Bakersfield, ultimate beneficiary of Shasta storage, 500 miles further south.

At the present time about 70 miles of the Friant-Kern Canal system has been awarded to contractors, and work has started on the Delta-Mendota Canal. The 37-mile sector of the first contract is continuous, except for a siphon contract at Little Dry Creek, several miles below Friant Dam.

Aside from its unusual machines, the first big contract is of especial interest because of a number of safe construction practices where work is hazardous. These will be discussed.

Canal Design

Cut through earth and heavy rock at an average gentle slope of 0.528 foot per mile, the canal will have a bottom width of 36 feet. The side slopes are being trimmed 1¼ to 1 with a special machine, and the mechanical concrete-placing device leaves near-finished lining on that steep slope. The canal sides and bottom are being lined with 3½ inches of Class A concrete, without reinforcement.

The design of concrete lining without reinforcement on a part of the finished Madera Canal system proved to be economical and sturdy; therefore the scheme is being followed on the first Friant-Kern job. Farther down on Friant-Kern, where the water will flow through a land of impermeable clay and silt, a section may be left unlined. For the most part, however, it will have to be concreted to Bakersfield to stand the severe test of years of use.

There are sharp curves in the first contract because the canal leads through mountainous terrain. Some curve radii are as low as 250 feet. With a canal top width of 80 feet, special trimming and pouring equipment had to be built 85 feet wide between wheels. If you can picture the practical difficulty of taking a machine that wide around that sharp a curve, pouring good concrete meanwhile, then you will have some idea of the construction feat that has been successfully performed for some months.

The Contractor's Organization

Spread out over many miles, with access roads not too easy to find, the job promised to be a difficult one to organize to the best advantage. That was neatly solved from the start by Project Manager K. C. Wasson, who split the long canal up into nine sections. To each of these nine subdivisions he spotted man-power, machines, materials, supplies, and a mechanical repair force. The progress schedule of each section was so arranged that it would mesh smoothly in the overall completion picture.

This means, of course, that sometimes certain sections are inactive. When the job was visited, only four sections were "live". Each had its own mechanics, repair parts, and supplies necessary to keep the equipment highballing at top speed. Transfers of man-power between the sections were being held to a minimum for two reasons. One was safety. The other was to develop in the mind of each workman a feeling that he was a real part of his section of the job.

Unlike the negative effort Mark Twain deplored in connection with the weather, this contract organization is *doing* something definite in almost every phase of construction to make the job safe for its workmen. The safety representative from Employers Mutual Liability Insurance Co. of Wausau, Wis., the contractor's insurance underwriters, visits the job regularly; he works in close harmony with the safety representative from the Bureau of Reclamation.

Safe practices on this job are the common-sense unpretentious kind. When the contractor moved in to start work, each active section was equipped with a skid-mounted receptacle for clean drinking-water barrels, Lily-Tulip sanitary paper drinking cups, and shelves where men might store their lunch kits out of the dirt. A service man keeps each of these units scrubbed clean, and water barrels are cleaned and sterilized each time they are filled.

Blasting

Excavation in the canal prism was bid for a price of 44 cents per cubic yard throughout, regardless of whether excavation was through sandy ground or deep formations of granite and schist. These hard-rock formations, requiring

(*Continued on next page*)

Bureau of Reclamation Photos

(1) Looking downstream from the Friant-Kern Canal's left bank, we see digging, ripping, and drilling all in progress on a "live" section—one of nine into which the contractor split the 37-mile job. (2) Specifications allow the contractor to tamp selected-earth backfill in over-excavated rock sections. So a special rig was built with an 18 x 28-inch tamping foot mounted on a boom anchored to a steel skid-mounted platform. (3) The 1,600-foot-pound tamper travels up and down the boom to reach all the slope with about 70 blows a minute. A hand-operated winch assures up-and-down boom control; an I-R air hoist near the operator's seat controls tamper travel along the boom. (4) The contractor also had designed a rail-mounted machine to place the 3½-inch concrete. It comprises a traveling car set on transverse rails, which receives concrete from the paver and distributes it across the canal. Steel-plate slip forms on the bottom press the concrete down flat against the bottom and sides of the canal.

Bureau of Reclamation Photo

Common-sense safety practices feature the 37-mile contract on the Friant-Kern irrigation canal. These include covered drinking-water containers, paper cups, salt tablets, and safety posters. The poster shown at the left is on how to lift.

Special Equipment Sets Canal Record

(Continued from preceding page)

drilling and explosives, were to be found in 40 per cent of the job. But the contractor anticipated the cost of rock work and balanced it with dirt-moving when he placed the successful bid.

The explosive ratio for granite and schist had been calculated at 0.75 pound per cubic yard—though this has since been revised upwards in practice—and 1,000,000 pounds of war-surplus du Pont 60 per cent gelatin dynamite in sticks was purchased from the WAA. This was stored in an abandoned pumice mine about 2 miles from Friant Dam.

In order to keep dynamite or caps out of the hands of inexperienced persons, powder is brought out only when holes are ready to load, and caps are stored separately. All explosives are behind a locked door except when authorized powdermen are hauling or using such material.

Drilling equipment consists of four Ingersoll-Rand FM-2 wagon drills, a dozen Ingersoll-Rand Jackhamers, a 6-inch air header with valves and flexible hose leading to the drills, and a central battery of three Gardner-Denver 500-cfm air compressors. This central battery of heavy compressors is used in conjunction with the wagon-drill outfit in thick rock cuts. The Jackhamers, powered by smaller compressors, drill in softer and shallower cuts.

When the job was visited, all the heavy-duty equipment was mobilized on a deep blue-granite cut section adjoining the Little Dry Creek siphon. It was one of those tough, rocky places where repeat orders for shooting are the rule, rather than the exception.

"When we move back in here to shoot a lift, we set up camp to stay for a while," laughed the drill boss.

The air header had been laid from a protected and level area below the point of the mountain, and a parts shop and repair headquarters established. The first lift had already been shot and removed, and drillers were busy with their Ingersoll-Rand wagon drills on the second 24-foot lift.

Timken drill steel in 6, 12, 18, and 24-foot lengths was in evidence. Timken detachable rock bits were brought in and taken out by the boxful. The formation was so hard that cool water was circulated by pump through the holes to help keep drill bits cool, and even so, some were dulling in 2 inches of travel. Maximum drill travel for a bit in any of this granite was 30 inches. Holes were started with new bits 2½ inches in diameter, tapering down slowly as the 12, 18, and 24-foot steel was used in that order. Each driller had a helper who assisted in changing steel, screwing on new bits, and keeping the work area orderly.

Drill holes were spaced on 9-foot centers and drilling was directed to a point 2 feet below the bottom canal grade and 1 foot below side-slope neat lines. Each hole was sprung initially with 4 sticks of 60 per cent gelatin, the stemming sand was blown out, and 15 sticks then were shot. This second springing mashed a pocket capable of holding 45 to 50 sticks. After the hole was again cleared, powder for the main loading was put in at the ratio of 1⅛ pounds per cubic yard. That quantity helped to fracture the formation enough to ease the working strains of draglines engaged in excavation.

The rate of progress on these holes averaged 1 hour and 10 minutes for drilling 24 feet, and 30 minutes for cleaning and springing. Detachable rock bits were sharpened four times and then discarded.

A serious menace reared its head early in the job in connection with springing, and safety-first rules were made—fortunately before anyone was seriously hurt. In springing the holes, the stemming sand blew upwards and often formed a plug just above the spring pocket. When drillers tried to go through this collar with Jackhamers and drill steel, there were two instances where sparks from the bit set off unexploded powder.

Reasoning that the wet holes and poor stemming material might be helping these explosive collars to form, the drill boss immediately ordered all holes to be thoroughly blown out with compressed air and a long pipe prior to loading. He also scouted the country for more suitable stemming sand, and found it in the form of disintegrated granite particles. Finally, drillers who worked on the few subsequent collars thereafter stood a little back from the hole, wearing heavy gloves and safety goggles.

One of the men who was a victim of the first accidental explosion was wearing safety goggles when it happened. His goggles were literally pock-marked with flying sand, but the glasses were not broken and his eyes were unharmed. A thousand dollars will not buy that pair of glasses from that man.

The main explosive shots were pulled approximately 200 holes at a time, using a light-plant circuit at the dragline to set off the No. 6 electric blasting caps. In a few places where spongy, decomposed granite was found, some granular powder was used to advantage.

Excavation

The first heavy-duty excavating machine to appear on the first contract was a Bucyrus-Monighan Model 5W walking dragline; it carried a 5-cubic-yard Esco rock bucket on a 115-foot steel boom. A Northwest 80-D shovel with two 12-yard end-dump Euclids was brought in to assist in the heavy rock. Still later a Marion Type 7200 walking dragline with a 5-yard bucket and a 130-foot boom was purchased through Shaw Sales & Service Co. of Los An-

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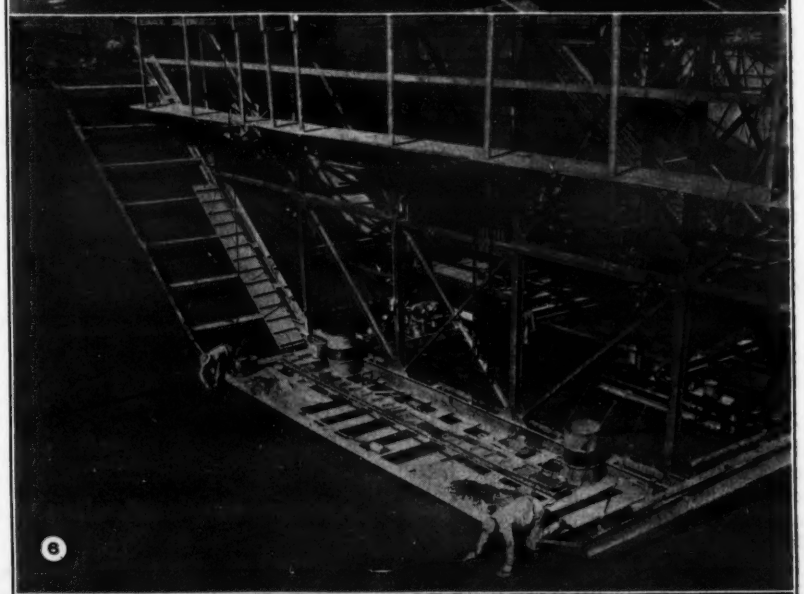

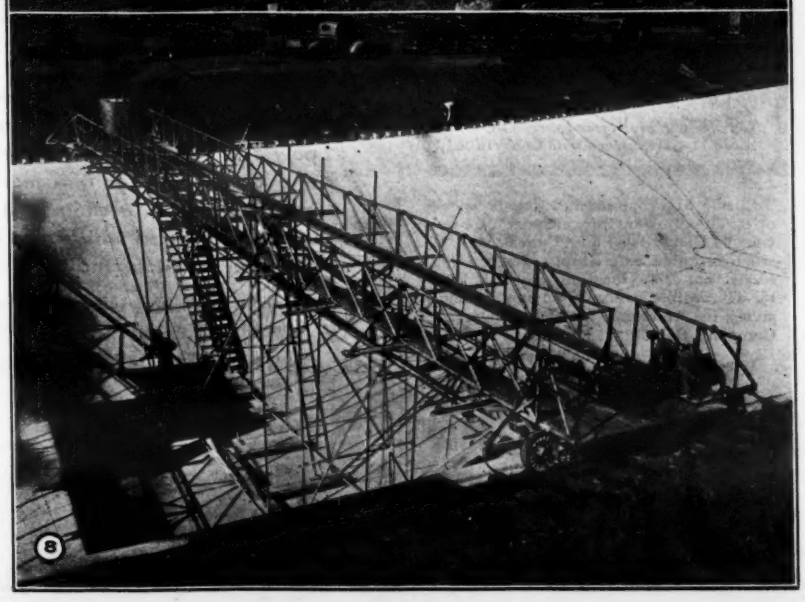

Bureau of Reclamation Photos

(5) A rear view of the slip-form liner shows work platforms with guard rails for safety; the 20 tons of sand ballast loaded on to increase the rig's manufactured weight of 75 tons; and a gang of workers hand-finishing the canal surface once the liner has laid it to uniform thickness. (6) A rail-mounted jumbo follows the liner. Inside it can be seen machines that cut the contraction joints which run transverse to the canal axis, as workers do hand-dressing with steel trowels. (7) From another jumbo, asphaltic filler is applied by air gun to the joints. It is designed to seal off any water leakage from the crack which will develop under each joint. When the material cools, it jells and looks like sponge rubber. (8) Finally Sure-Cure white-pigmented concrete-sealing solution is sprayed on the lining surface from another rail-mounted machine at the rate of 150 square feet to the gallon. It leaves the finished canal with a light-reflecting surface.

Special Equipment Sets Canal Record

(*Continued from preceding page*)

geles.

The Monighan was put in rock from the start. A road for its digging table was smoothed out ahead of the rig by a Caterpillar-D8-mounted bulldozer and a Caterpillar No. 12 motor grader. At the present time this rig is digging in heavy blasted rock, making an average of two swings per minute. Excavated material is cast mostly on the south side of the canal on USBR right-of-way.

The 80-D Northwest shovel with the two Euclids is accounting for 40 cubic yards per digging hour, on the average. This material is dumped about 100 feet to the right of the canal bank, near the cut.

The Marion Type 7200, working farther ahead, is fighting about the same kind of condition as is the Bucyrus-Monighan, and at the same rate of progress. The digging bucket on all machines is going slightly below the neat rock lines, but this has to be. The practical difficulties of digging hard rock to exact grade are so enormous that it is more economical from the contractor's standpoint to go slightly below and backfill it later. Rock is dug clean along the slopes, but a Caterpillar-D8-mounted bulldozer is dressing the bottom towards the shovel in order to make the digging time of the big draglines more productive.

The excessive abrasion of some of the rock formations is almost unbelievable. Here and there along the excavated canal, discarded or worn dragline buckets tell a mute but graphic story of cruel and unusual punishment etched in rusty letters. Great gaping scratches mar the smooth carbon-steel back of the manganese lips, as if some powerful monster had raked the buckets with wicked claws. Steel-lip rivet heads are smashed and bruised. Gaping wounds in the digging arch are indicative of the cutting ability of the rock. The sight of these buckets makes one glance instinctively towards the big walking draglines to make certain they are still all together and digging.

In an effort to fight this condition, the finest hard-facing rods of several manufacturers were tried simultaneously on one bucket, and the results studied. Bucket teeth and lips were built up. Early in the job the hard-facing was put on dragline-bucket teeth in single beads, leaving about ¼ inch of parent metal exposed between beads. A decomposed granite formation literally melted the parent metal out from under the welds, undercutting them so seriously that they broke loose and dropped off. It was necessary to change hard-facing procedure to lap the beads and make a continuous covering. Mir-O-Col No. 2 rod emerged victorious in the tests, and is now used exclusively for abrasion prevention.

Excavation started at the Friant Dam end of the job and is proceeding south. An abandoned Army target-range camp located about halfway through the contract has been put back in service, and is being used to feed and house many of the men.

Special Backfill Rig

Bureau of Reclamation specifications regarding the breakage of rock beyond limit lines allow the contractor to tamp selected-earth backfill back in place to the neat concrete line. Faced with the problem of tamping earth on a 1¼ to 1 side slope, the contractor was forced to design a special machine capable of tamping to 95 per cent of laboratory densities or better.

The cylinder and piston rod from an Emsco concrete-cutting machine were secured, and a somewhat larger tamping shoe was installed. This was set up in two channel irons on the boom, so the tamping foot could travel up and down the boom to reach all the slope.

The boom was anchored to the corners of a steel skid-mounted platform 20 feet square, and fastened by cable to upright H-beams on the back of the platform. Up-and-down boom control was assured by a hand-operated winch. Enough concrete-block counterweight was added near the uprights to guarantee the stability of the machine.

An Ingersoll-Rand air hoist was installed near the operator's seat for controlling the travel of the tamper up and down the boom. A hand-operated valve was installed, replacing an automatic valve which was tried without success. The manually operated valve is opened and closed by the operator; he regulates the 1,600-foot-pound tamping foot to approximately 70 blows per minute.

Damp earth is dumped along the slope by a dragline, and lifts are limited to 24 inches in thickness. This takes care of all but the deep fissures that have been blasted in the rock. Tamping is controlled in an up-and-down path by the operator, who signals for a move ahead when he is ready. The skid-mounted tamper is towed by a Caterpillar D8 tractor, but for safety's sake the operator of the tamping machine gives all the signals.

Tamping is being done to leave the canal sides slightly full so the trimming machine will have something to work against, and the rate of progress is 70 linear feet per hour. The machine generally works up one side of the canal for several hundred feet, crosses to the opposite side and finishes that section

(*Continued on next page*)

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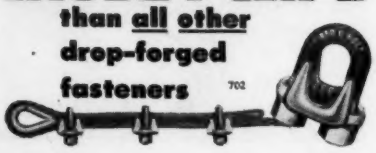

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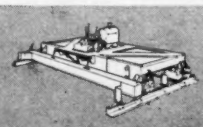

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Bureau of Reclamation Photo
The camera catches culvert work on the Friant-Kern Canal, part of a comprehensive project to develop California's Central Valley. Workers here are compacting backfill with tampers.

Special Equipment Sets Canal Record

(Continued from preceding page)

before the tractor moves it on ahead. A Chicago Pneumatic 500-cfm air compressor furnishes the power for the tamper, air hoist, and the oiling system.

Intermediate Steps

Completion of backfill tamping by the special machine is the signal for a series of intermediate steps; these must be taken hurriedly, so the canal will be ready for the special trimmer and the lining machine which follow. The steps consist of setting the final grade and alignment stakes, hand-grading a rail berm on each side of the ditch, and placing steel rails to carry mechanized equipment.

A four-man Bureau of Reclamation survey party sets stakes about a mile ahead of the machines. On the straightaway tangent sections, which are not numerous, these stakes go in every 50 feet. Centers are closed up around the curves. In some rocky berms, surveyors have resorted to the use of jackhammers to get space for stakes. They road them in to exact grade instead of leaving a cut or fill reference written on a guard stake. Nothing is left to misinterpretation or chance by this method.

The grading of a berm for the steel rails is usually roughed out by a Northwest dragline, semi-finished by a bulldozer, and finished to fine grade by hand when the rail sections are laid. Ordinarily the rail sections are 30 feet in length, though some have been broken under the weight of ponderous machines. Rail sections are picked up along the finished canal by a Lorain Moto-Crane, loaded on a flat-bed trailer, and hauled ten at a trip over a service road to the place where they are laid.

They are set in place with the crane, yo-heaved to line by crowbar, and staked on each side of each section by a 1-inch steel pin 24 inches long. Sections are joined by a splice flange with four machine bolts. The nuts are drawn snug by socket wrenches and loosened the same way when the rails are dismantled. Timber ties 8 x 8 inches on 12-inch centers support the rails.

Track is laid at least 1,000 feet ahead of trimming and pouring machines; this is not too great a margin of leeway when one shift pours half that distance. The ground under the ties is tamped to give full bearing to each timber, and to make the rails as level as possible. There are hydraulic-jack adjustments on the corners of the special machines to take care of this inequality, but their manual operation calls for much less work and they do a better job if the rails are kept as level and true as possible.

A sure way for the rail crew to make the concrete-placing superintendent howling mad is to lay track uneven enough so the heavy machines snap the steel rails.

Canal Trimming and Grading

A canal-trimming rig, built at great expense specially for this job by Guntert & Zimmerman Machinery Co. of Stockton, Calif., is the first heavy machine to work in the line-up of rail-mounted equipment. It embodies the endless bucket-chain principle of excavation and has two bucket systems.

Each bucket chain turns from the center line of the canal. Both bucket chains begin the digging cycle at the center line and continue up the slope to the top, where they discharge the earth to rubber conveyors. There are 14 buckets on each chain, with the detachable H & L steel teeth set on the vertical lip of each bucket. This leaves a smooth side of each bucket, without teeth, down against the earth slope to guarantee a slick trimming job.

Digging buckets dump their loads to a system of rubber conveyor belts driven by electric motors. All of these lead eventually to a 36-inch main belt conveyor, which dumps the excess dirt in the clear of the canal.

Two stripped-down Caterpillar D7 tractors, mounted on the upper deck of the 85-foot machine, turn the chain of buckets through their drive sprockets. There is a 15-kw Caterpillar D4600 generating set, using a Louis-Allis generator, to furnish electric power for the conveyor motors. A Caterpillar D4600 diesel engine drives the trimmer through a set of drive gears. This controls travel forward and reverse.

The driveshaft of the trimming machine is split in the center, so one set of wheels can be made to turn faster than the others. This makes it possible to round a curve. Even with this provision it requires a great deal of experience for an operator to bring the weighty machine slowly around a sharp curve, digging all the while.

It will be remembered that the backfill tamper filled the canal sides with solid material. This device left the slopes about 6 inches full in order to give the trimmer a solid face on which to work, and to make a solid resting place for the concrete lining. Early in the job the contractor tried to control blasting too close to the neat grade lines. It was a mistake. Protruding rocks played hob with the trimmer buckets.

So it was discovered the hard way that it would be faster and less destructive on special equipment to blast a bit deeper, put a little more earth on the sides in the tamping operation, and give

(Continued on next page)

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Special Equipment Sets Canal Record

(*Continued from preceding page*)

the trimmer solid but not rocky material in which to work. Once that was done the machine began to move forward at the rate of a foot per minute. Before it was done, shutdowns had been frequent. As many as 150 teeth per day had to be installed when the material was full of rocks.

This special trimmer does a beautifully smooth job of dressing the canal slopes and bottom. However, despite the best intentions of everyone, there are some rocks which are ripped up by the trimmer. They leave a few holes and uneven places behind the machine. A six-man labor crew with hand shovels and a Chicago Pneumatic CP-4 tamper backfills these holes, dresses any uneven places, and leaves the grade as smooth as a floor. A portable Chicago Pneumatic compressor is used to power the tamper.

In working on the steep side slopes, the grading-crew members use a safety-first scheme which also very neatly prevents damage to the earth sides. They have half a dozen 2 x 12 gangplanks with nailed safety cleats on which they can walk without slipping. A steel hook in the upper end of the board anchors it securely to the steel rail on top of the berm. A man can walk up this walkway safely, even though he is lugging a heavy tool. When he finishes filling a hole the earth is not marred by his footprints.

The canal sides and floor must be trimmed absolutely true to grade. It is easy to visualize the wavy and uneven grade certain to result if the trimmer had no up-and-down adjustment, but merely rode uneven rails over hard and soft ground.

Each corner of the trimmer has therefore been equipped with a Rodgers hydraulic jack to keep the machine floating level and true, irrespective of the position of the wheels. A man on each side of the machine tends these jacks constantly. A piano wire, stretched taut from survey hub to survey hub, is the constant reference. There is a small steel outrigger level on the trimmer frame. When this level is adjusted to the piano-wire line by the hydraulic jacks, the canal grade is almost as smooth and perfect as a draftsman can draw it with his pencil.

On account of the bad weather after November 1, the trimmer worked only about a day's run ahead of the placing machine during the winter months. From the time the canal sides are finished until the lining machine comes along, the earth is sprinkled frequently but lightly with water from a 1½-inch hose, moved ahead from valve to valve along the water-supply line.

Warning signs prevent workmen not actually employed on the trimmer from coming aboard, and keep away any unauthorized person lest he involve himself in an accident on the bucket line of the machine.

Placing of Concrete

When the concrete lining was designed on a 1¼ to 1 slope, engineers and contractors alike were skeptical. How dry would concrete have to be placed to stand up on that sharp slope? It had been done before, but not on such a massive scale.

After studying this job and a similar example on the Coachella Branch of the All-American Canal system, the contractor placed an order with Guntert & Zimmerman Machinery Co., of Stockton for the manufacture of a special concrete-placing machine. The order included the trimmer described previously.

This special all-steel placing device—or slip form—is designed to receive mixed concrete direct from a paver, to distribute and vibrate the mix, and to move ahead, leaving the sides and bottom of the canal coated with a uniform 3½-inch blanket of concrete lining. Such a machine, it was estimated, would line about 50 feet of canal per hour. It was built to a designed weight of 75 tons; it is 85 feet wide between wheel centers, with a 30-foot wheelbase at each end.

Drive gears were arranged similarly to those on the trimmer, and a Caterpillar D4600 diesel engine used for motive power. A traveling car was set on transverse rails. It was designed to receive concrete from the paver and distribute it across the canal. A bulkhead was built up to the level of the car to train the concrete into hopper bins, or boxes, at the foot of the machine. Designed to catch and hold the concrete in a feeding position, they also were built of steel plate.

Tube vibrators were installed behind the feeder hoppers and two Viber stand-by electric vibrators were installed for emergency duty or special vibration of any exceptionally dry concrete. A Caterpillar D4600 diesel-electric generating set was installed to furnish power to the vibrators and other electric motors on the rig.

Steel-plate slip forms on the bottom of the machine were designed to press the concrete down flat against the bottom and sides of the new canal and leave the lining in a semi-finished condition as the machine traveled along. Two steel cutting knives 1½ inches long, fastened to the bottom of the slip form near the bottom of the slope on the canal floor line, were welded on to

(*Continued on next page*)

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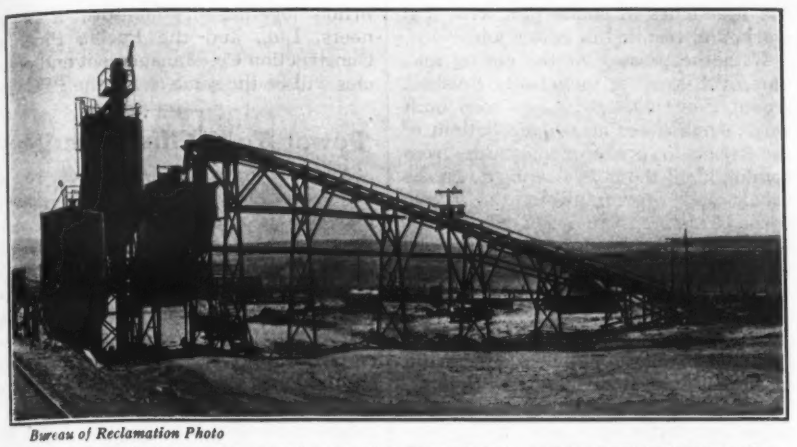

Bureau of Reclamation Photo

The contractor's batching plant is located near Friant. Trucks haul batches to the job and dump to the skip of a Koehring Twinbatch paver. There the concrete is mixed 60 seconds, dumped to the paver bucket, moved out on its 30-foot boom, and passed by hopper to the traveling car on the slip-form liner.

Special Equipment Sets Canal Record

(Continued from preceding page)

open up the longitudinal contraction joints. Platforms with guard rails were attached on the back of the rig so men could adjust the engines or do other work.

The machine was assembled on the job near Friant Dam as the parts arrived from Stockton. The rig was ready to go actually before it was scheduled, so a slight wait was necessary. Excavation was almost 5 miles ahead when the placing of concrete began.

At first it seemed as if the new rig would never run steadily. But a concentrated effort to iron out the bugs was so successful that a 521-foot pour was made in 6½ hours of actual running time on December 2, 1946. At that date the lining was only 1½ miles along. One of the first problems was the one of weight. The manufactured weight of 75 tons was too light. The placing machine simply rose right up out of the concrete, so to speak. When 20 additional tons of sand ballast in bags was loaded on amidships, it cured the difficulty.

Although a differential drive had been built into the rig, its manufacturer had not reckoned altogether with the straight-line effect of a 30-foot wheelbase in rounding curves. In practice, it posed the problem of a 30-foot chord on short arcs. On sharp curves, the machine tended to drift off location, enough to cause alarm. That one was solved by offsetting the rail on the outside of the curve slightly wider than usual, and by never "jamming" the inside of the arc with that wheel in going around a curve. Always at such times both sets of wheels are turning; the ones on the outside curve move faster, of course.

The tube vibrators were too far back to disperse the 1½-inch maximum-size rock in the mix, so they were moved 24 inches ahead to a point close behind the feeder boxes. These bugs were the principal causes of lost time when the project was new. But as soon as they were corrected, the lining machine exceeded its designed rate of progress.

Four Rodgers hydraulic jacks keep this machine on the right plane with the canal. The same piano wire is used for reference as is used on the trimming machine.

Concrete sand and aggregates are produced from the old Friant Dam supply source by George Pollock Co. for use on this entire contract. Aggregates are dry-batched with bulk Permanente portland cement from the contractor's storage plant. When the 521-foot pour was made, six Ford trucks, each hauling 4 batches 1¼ miles, were used. Batch trucks dump to the skip of a Koehring Twinbatch paver. The concrete is mixed 60 seconds, dumped to the paver bucket, moved out on its 30-foot boom, and passed by hopper to the traveling car on the lining machine.

Fresh mixing water is lifted from the San Joaquin River by a Gorman-Rupp 6-inch centrifugal pump and distributed through a 6-inch pipe header to the paver. The same header furnishes the sprinkling hose ahead of the lining machine.

The placing-machine operator controls the travel of the machine from an operating platform, and he actuates the tube vibrators through Cutler-Hammer electric push buttons. Another operator controls the traveling concrete bucket. Because of the very great danger involved in zipping past structural members, the bucket-operating platform where that workman stands has been caged with heavy steel-wire netting. This safeguard has prevented the operator from inadvertently getting an arm or leg out of bounds, where it would be sure to be mashed off should the car be moving.

Concrete Finishing and Joints

The principal concentration of finishers and dummy-joint dressers is located on a special machine, rail-mounted just behind the placing machine. When this machine was built it was believed that the concrete lining could successfully be finished by machinery, and three mechanical concrete finishers were installed on a steel track. One machine was mounted on each slope and one was designed to finish the bottom of the canal. The slope finishers

(Concluded on next page)

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YAUN DRAGLINE BUCKETS AND MFG. PLANT
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Special Equipment Sets Canal Record

(*Continued from preceding page*)

were also fitted with a steel knife which would cut the up-and-down contraction joints every 20 feet.

Unfortunately, mechanical finishing was not successful on the slopes. Concrete placed at a 1¾-inch slump would sag and run under the action of the machines. It was necessary to employ an average of sixteen finishers to do this work. Ten of these men work directly behind the placing machine with long-handled floats, while an average of six are used on steel hand-troweling and dummy-joint dressing. All contraction joints, cut by machine-mounted knives, were being carefully dressed by hand when the job was visited.

Joint Sealing

After the contraction joints are cut and the edges nicely dressed with an edging tool, the joints are filled with a special asphalt filler applied by air pressure. If this material does what it is designed to do, it will seal off any water leakage from the future crack which will develop under each contraction joint.

Under a subcontract with Hunt Process Co. of Los Angeles, the mix is blended and applied. The mix proportion consists of 4 pounds of Enamelite liquid and 3 pounds of Enamelite dry asphalt. It is mixed in a mixer drum, and blended by a paddle driven by a Briggs & Stratton engine. Air guns are then loaded with the mix and a man applies the material flush with the top of each joint. When this material cools, it jells and assumes the appearance of sponge rubber.

The proper proportioning of this mix is carefully controlled by one man with an accurate set of Fairbanks-Morse scales. He wears heavy gloves and uses a wood paddle to load the air tubes to avoid the danger of serious burns.

Concrete Curing

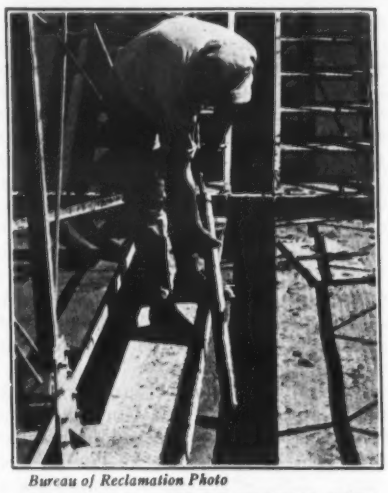
The first half of the concrete curing was subcontracted to S. P. Lyons Co. of Los Angeles. The firm applies its own Sure-Cure white-pigmented concrete-sealing solution to the lining surface by a special coating machine. Designed and built under the supervision of S. P. Lyons, the main feature of the machine is that one man can spray the solution and at the same time control the movement of the rig.

The curing machine is rail-mounted and travels along the same set of tracks used by the placing and trimmer machines, although often the passage of these heavier machines makes the alignment of the track rather difficult for the curing rig to follow. A set of welded structural guides was fastened along each wheel, to extend below the track level several inches. This precaution forced the curing machine back on the track whenever it started to bind.

Sure-Cure sealing solution is transferred to a 275-gallon storage reservoir on the machine. Briggs & Stratton engines with 1-inch centrifugal pumps are used to transfer and spray the sealing solution, while the travel of the rig is controlled by one Briggs & Stratton and one ancient Nelson engine which has given remarkable service.

The solution is sprayed at the rate of 150 square feet to the gallon, leaving the finished canal with a light-reflecting surface. Tests made by the Bureau of Reclamation have proved the efficiency of this seal.

The last half of the curing has been subbed to the Hunt Process Co. of Los Angeles, which will use its own special pigmented Hunt Process cure. The subcontracting of concrete curing on large jobs throughout the west seems to have relieved prime contractors of many of the headaches in connection with that work, and resulted in better jobs.



Bureau of Reclamation Photo

This close-up shows a workman using an air gun to apply asphaltic filler flush with the top of a contraction joint on the newly lined surface of the Friant-Kern Canal.

With the passage of the curing machine the canal is technically finished. About every 500 feet a few men built small earth dikes across the bottom of the canal to prevent rainwater from coming in off the hills, flowing down the canal, and drowning out the active work. This precaution is of course necessary only during those winter months when rainfall is expected.

Personnel

R. K. Durant is the Construction Engineer in charge of field work for the U. S. Bureau of Reclamation, with K. C. Wasson in charge of the job for the prime contractor.

Pipe-Line Firm Formed

A partnership has been formed by two west-coast firms to engage in a general pipe-line construction business under the name Pacific Pipeline & Engineers, Ltd. The new partnership brings together the facilities of Engineers, Ltd., and the Pacific Pipeline Construction Co. Management and policies will be the same as for the PPC Co.

Power Take-Offs Described

A bulletin which describes seven models of Davey heavy-duty power take-offs is announced by the Truck Equipment Division, Davey Compressor Co., Kent, Ohio.

Bulletin 108-A lists take-off operating principles; it gives installation data and complete specifications. It places emphasis upon Davey's internal and external gear drive which is designed to operate as a strong and durable spline.

Also described are various types of truck-mounted power equipment which can be driven advantageously through take-offs: compressors, generators, concrete mixers, welders, machine-shop tools, pumps, rock crushers, etc.

Copies of this literature may be obtained from the company. Or use the enclosed Red Request Card. Circle No. 100.

Small-Size Scraper Has Movable Apron

A 1-yard scraper for use with a Ford-Ferguson rubber-tired tractor is made by the Western Equipment Mfg. Co., P. O. Box 105, Glendale, Calif. With the help of its movable apron, the unit can be loaded to exceed this capacity by one-third, the manufacturer says. The Overland scraper utilizes the regular Ford-Ferguson hydraulic lift to regulate the cutting blade for digging, spreading, and dumping operations.

The apron employed on these scrapers is similar in construction and operation to those found on large units. When the bowl is almost full, the dirt falls forward onto the apron. Then, by raising and lowering the scraper with the Ford-Ferguson lift, the operator can load an extra amount of dirt on the apron. The weight of this dirt causes the apron to close automatically when the scraper is raised off the ground. Lowering the scraper automatically opens the apron and permits the load to be dumped. Practically one-third of the dirt is carried on the apron when the scraper is loaded.

The Overland 1-yard scraper, for use with a Ford-Ferguson rubber-tired tractor, features a movable apron designed to increase its capacity by one-third.

The reversible cutting blade is made of plow-steel, ⅜ x 6 inches x 5 feet. Depth of spread is from 0 to 12 inches, overall length is 10 feet, overall width is 5 feet 9 inches, and the approximate shipping weight is 1,050 pounds.

Further information may be secured from the company, or by using the enclosed Request Card. Circle No. 18.

Dump-Truck Semi-Trailer

A low-platform semi-trailer that attaches to a standard dump truck is described in a broadside issued by the Mead Machine & Iron Works, Inc., 606 Lexington Ave., Warren, Pa. It is designed primarily for transporting construction equipment from 10 to 25 tons in weight.

The trailer has a single-drop deck, and either single or trunnion axles with four or eight wheels. The deck flooring is of 2-inch oak or ash. There are various platform heights from 28½ inches minimum, depending on tire size and whether flush or above the floor. The broadside lists the features of the Mead trailer, and explains that neck sizes in various capacities cover practically all conventional trucks.

Copies of this literature may be obtained from the company. Or use the enclosed Red Request Card. Circle No. 99.

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Here, too, effective lubrication is vital. *Texaco Alcaid, Algol and Ursa Oils* provide effective lubrication, prevent hard carbon formations, keep valves clean and active, rings free, ports open and air lines clear. Your Texaco Lubrication Engineer will recommend the right one to keep your compressors running right — efficiently and economically.

Lubricants and Fuels
FOR ALL CONTRACTORS' EQUIPMENT

North Atlantic Highway Officials Hold Meeting

Attendance Is Large at 23rd Annual Convention: New Developments and Problems Discussed: 1947 Officers

✦ MORE THAN 1,400 highway officials and engineers, contractors, manufacturers of road equipment, and others interested in the national highway program attended the 23rd Annual Convention of the Association of Highway Officials of the North Atlantic States in Atlantic City on February 26-28.

The new officers elected to serve for 1947 are W. B. McKendrick, Jr., Assistant Chief Engineer, Delaware State Highway Department, as President; and Wilson T. Ballard, Chief Engineer, Maryland State Roads Commission, as Vice President. A. Lee Grover, Secretary, New Jersey State Highway Department, who has served the Association for many years as Secretary and Treasurer, was re-elected.

To succeed Captain H. C. Whitehurst, Director of Highways, Washington, D.C., J. N. Robertson, Deputy Director of Highways in Washington, was elected to the Association Board of Directors.

First-Day Sessions

The opening session was given over to the customary remarks of welcome, a report by Captain H. C. Whitehurst, President of the Association, and an address by Spencer Miller, Jr., New Jersey State Highway Commissioner.

Mr. Miller presided at the afternoon session. Donald Schapiro, of the Bureau of Highway Traffic, Yale University, described a research project to study the behavior of traffic at urban intersections. The results of the project will be published in a pamphlet "Traffic Performance at Urban Intersections".

Thomas H. MacDonald, Commissioner of Public Roads, gave a paper on present-day highway-traffic conditions. He pointed out that since the major lines of travel now in existence will continue, road builders must think of these roads in terms of the future. And he stated that controlled access will have to be the solution to the problem in heavily traveled areas.

Pennsylvania's use of highway maintenance forces for the construction of its extensive secondary-road system was described by Warren K. Myers, Chief Maintenance Engineer of that State's Department of Highways.

Aspects of Bituminous Paving

Developments in bituminous paving was the theme of the third session, at which W. B. McKendrick, Jr.,.of Delaware presided.

J. E. Lawrence, Maintenance Engineer of the Massachusetts Department of Public Works, described that state's successful use of anti-stripping agents in bituminous mixes and in surface treatment. Such agents, either mixed with the bitumen or applied to the aggregate, counteract the effect of moisture. They make possible patching or surfacing operations in unfavorable weather or without drying the aggregate.

"Tar-Concrete Pavements" was the name of a paper by A. R. Taylor, Consulting Engineer of The Koppers Co. In Mr. Taylor's absence, the paper was presented by Paul F. Phelan.

Bernard E. Gray, General Manager, The Asphalt Institute, reported on new developments in the use of asphaltic materials in highway construction and maintenance. He pointed out: (1) The critical item in a highway is the construction of the base. For tests have proved that surprisingly thin surfaces will stand up under very heavy loads

(Continued on next page)

North Atlantic Highway Officials Hold Meeting

(*Continued from preceding page*)

if the base materials are properly selected and consolidated. (2) More consideration should be given to the density of asphaltic mixes. And (3) asphalt is being used to underseal old pavements, where subgrade failure is apparent, as part of the reconditioning process. It has been used in many places to correct pumping at joints. But now in some states it is being extended to the entire length of pavement to be resurfaced, in order to strengthen the base.

The session's concluding paper was a discussion of the design and construction of cold-mixed cold-laid asphaltic-concrete pavements, presented by C. L. McKesson, Consultant, Engineering and Research, American Bitumuls Co.

Messages for Road Builders

Presided over by Charles H. Sells, Superintendent of the New York State Department of Public Works, the fourth session brought a variety of topics before the assembly.

D. W. Winkelman of D. W. Winkelman & Co., Syracuse, N.Y., and Vice President of the Associated General Contractors of America, presented a highway builder's view of the highway program. He reported on some of the conditions which have resulted in our lagging highway program and made two suggestions for the highway industry: (1) that it get its own house in order for an economical and efficient highway program; (2) that it concentrate on a public-relations program to explain and get support for present-day increased highway costs.

He stated that greater mechanization of highway work can achieve greater economy. And he urged highway officials to adopt cost-reducing measures such as the elimination of hand-labor items, less rigid compaction requirements, standardization of concrete structures, the use of pipe instead of box culverts, etc.

Mr. Winkelman said he believed that highway departments have nothing to gain by holding up the highway program "to see what happens"; rather, the industry needs more contractors who will be encouraged to enter the field by a full and well balanced road-building program.

Photogrammetric mapping in highway-location studies—its limitations as well as its advantages, and its application to various types of problems—was discussed by William H. Meyer, Jr., Lockwood, Kessler & Bartlett, Inc., Engineers and Surveyors.

J. T. Callaway, Assistant to the Vice President, Goodyear Tire & Rubber Co., and President of the American Road Builders' Association, reported encouragingly on the construction-equipment picture. He outlined plans for the 1948 ARBA Road Show. And he concluded with a plea for greater highway safety.

The final paper of the afternoon was a report on air-entrained concrete,

(*Concluded on next page, Col. 2*)

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For 16 years more heavy-duty International Trucks have served American commerce and industry than any other make.

Now come *new* KB Models—light-duty, medium-duty and heavy-duty—with gross vehicle weight ratings from 4,400 to 35,100 pounds. Note the designation—KB.

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Try the new EXTRUSION COATED STOODY SELF-HARDENING on your wearing equipment . . a low-cost hard-facing rod that provides maximum resistance to impact and abrasion—with improved welding characteristics! Over 600 U.S. Dealers.

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BUY BONDS
BACK THEM

MARK well this button. It is worn by the men and women honorably discharged from the armed services. Though they are now in civilian clothes, let's not forget their service to our country and to us. They still rate our every consideration.

Shown here on a Caterpillar No. 12 motor grader, this gage made by Road Grader Gauge Corp., is said to permit the use of road graders for fine-grading. It runs along existing concrete, road forms, or other suitable guides.

Road Grader Adapted To Fine-Grade Work

A gage is made by the Road Grader Gauge Corp., Equitable Trust Bldg., Wilmington, Del., which is said to permit the use of road graders in fine-grading work. At present, it is being used on Adams, Allis-Chalmers, Caterpillar, and Austin-Western road graders, its manufacturer says.

It is built to work while running along existing concrete, road forms, or other suitable guides. According to the manufacturer, the gage is easily attached by one man, requires only a few simple adjustments, can be used for lanes of several widths, will permit fine-grading to any desired depth, and will not interfere with other operations of the grader.

Further information may be secured from the company, or by using the enclosed Request Card. Circle No. 26.

Collapsible Horses

Collapsible horses for use with 2 x 4's are manufactured by the Everhot Mfg. Co., Maywood, Ill. Made of 16-gage steel and said to be capable of supporting 4½ tons, they can be used with legs of any length. An assortment of horses is available by using these heads in combination with various-length legs.

With the Taylor collapsible-horse brackets no nails or braces are needed, the manufacturer explains. The legs wedge into the sockets, and are said to become more firmly entrenched with the addition of extra weight.

Further information may be secured from the company, or by using the enclosed Request Card. Circle No. 60.

Richkraft Dealer in West

Appointment of a new distributor in the west has been announced by the Richkraft Co. of Chicago. Located at 4599 Pacific Blvd., Los Angeles 11, Calif., Dealers Wholesale Co. will cover southern California; Arizona; Clark County, Nev.; and Sonora and Lower California, Mexico. The complete Richkraft line will be handled by the distributor.

FOR SECONDARY ROAD CONSTRUCTION...
ARIENS AGGMIXER

The swirling, chopping action of these tines does a thorough job of mixing, wet or dry.

HERE'S equipment designed especially for mixed-in-place construction—to operate in connection with other general purpose equipment. Wherever aggregates are used it thoroughly pulverizes, mixes and aerates aggregates with binder—rapidly and economically. Also ideal for soil cement stabilization. Safe and easy to operate . . . adjustable to any tractor . . . made 4 standard sizes, 4', 5', 6' and 7'. Write for details.

ARIENS COMPANY BRILLION WISCONSIN

North Atlantic Highway Officials Hold Meeting

(Continued from preceding page)

termed the outstanding development in concrete technology by L. E. Andrews, Regional Highway Engineer, Portland Cement Association. In commenting on the outlook for cement production, Mr. Andrews said it should be sufficient for the estimated volume of construction, barring strikes, lack of transportation facilities, etc.

Final Session

Robert M. Reindollar, Chairman of the Maryland State Roads Commission, presided at the concluding session.

A paper on radio communication in highway operations by Bruce W. Chilson, County Engineer of Chautauqua County, N.Y., and Chairman of the Radio Committee, American Road Builders' Association, was read by R. B. Traver, County Engineer of Onondaga County, N.Y. Cited as radio's advantages were the elimination of waste movement, increase in workers' morale, and above all greater safety.

The development of soil mechanics and its possibilities in highway construction were discussed by Earl F. Bennett, Principal Soils Engineer, New York State Department of Public Works. Mr. Bennett outlined the organization of a Highway Department Soils Bureau and its functions, and urged the employment by highway departments of trained soils engineers.

Roy W. Crum, Director of the Highway Research Board, reported on the highway research program.

A research project on concrete curing, which compared the wet-burlap and calcium-chloride methods, was described by H. C. Vollmer, Research Engineer, National Bureau of Standards.

Resolutions

Several resolutions were passed by the Association. They endorsed the highway safety program and pledged the group's compliance with its objectives; urged the passage by Congress of Bill H. R. 1874 to extend the availability of the Federal-Aid funds provided by the Federal-Aid Highway Act of 1944; and suggested that the Public Roads Administration undertake a survey of highway needs, so that all the essential facts would be available when the next Federal-Aid bill is presented in Congress.

Some discussion was aroused over Resolution 4. This put the Association on record as favoring retention of the Federal 1½-cent gasoline tax, provided the tax be returned to the states in direct proportion to the amount collected in each state. It provided that if any state increased the state gas tax no less than 1½ cents, for exclusive road use, the Federal tax should cease. And a further provision stated that this plan should in no way modify or supersede Federal Aid; that a plan gradually to return gasoline taxation to the states was favored. It was decided to refer this resolution to the Board of Directors.

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does the "IMPOSSIBLE" — automatically!

After you've watched any or all other finishers at work, see the B-G Tamping-Leveling Finisher! Alone among them all the B-G Finisher *automatically* measures the correct amount of compacted material and produces a level surface of uniform density—*a surface that is smooth and level, regardless of irregularities of the sub-grade.*

You might well have thought this an "impossible" job but it is only one of many features of B-G Finisher performance. It has a simple crown adjustment—places adjacent strips with no ridges at the joint. It handles any mix—hot or cold. Flexible, maneuverable and economical to operate, it offers outstanding performance from every standpoint.

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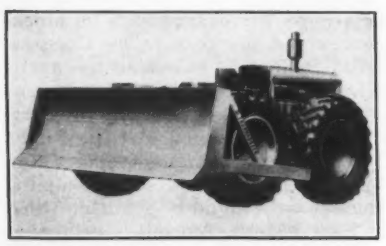

The Tournadozer, a new rubber-tired tractor-dozer unit, features four speeds forward, four in reverse, air-actuated disk clutches and brakes, and a cable-controlled bowl.

Rubber Tires Mount New Bulldozer Unit

A rubber-tired tractor mounted with a bulldozer has been added to its line of earth-moving equipment by R. G. LeTourneau, Inc., Peoria 8, Ill. Known as the Model C Tournadozer, it is powered by a 180-hp diesel engine. It has four forward speeds ranging up to 13.4 mph, and the same four speeds are available in reverse. It has a Tournamatic constant-mesh transmission; this, it is said, permits the operator to select any gear ratio or change from forward into reverse with no shifting of gears and no loss of momentum.

The operator is seated in front of the power unit and therefore has a clear view of his load and the terrain in front of the machine. He steers by the use of air-actuated disk clutches and brakes controlling the two wheels on each side. The bowl is cable-controlled and is operated by an air-actuated power unit.

Specifications include: wheelbase, 5 feet 11⅝ inches; length, 15 feet 2 inches; height, 7 feet 11 inches; width of blade, 11 feet 3 inches; height of bowl, 44 inches; height blade can be raised, 43 inches; unlimited blade lowering; shipping weight, approximately 14½ tons. The Tournadozer has four 14 x 32 taper-bead tires which, together with the rim design, permit operation at low air pressures, minimize equipment maintenance, and increase operator comfort, according to the manufacturer. Tournadozer design is said to be such that as power requirements increase, greater weight is put on the tires, giving them more ground-gripping traction and flotation.

LeTourneau has issued the following performance figures on the Tournadozer's earth-moving capacities: 184 cubic yards an hour on a 50-foot haul; 118 yards on a 100-foot haul; 66 on a 200-foot haul; 46 on a 300-foot haul; and 35 yards on a 400-foot haul. When used for pusher loading, the Model C Tournadozer is said to be able to serve two Tournapulls on a 300-foot one-way haul; three on a 1,000-foot haul; four on a 2,000-foot haul; five on a 3,000-foot haul; six on a 4,000-foot haul; seven on a 5,000-foot haul; and thirteen on a 10,000-foot haul.

Further information may be secured from the company, or by using the enclosed Request Card. Circle No. 38.

Euclid Promotes Paape

The appointment of W. W. Paape to the position of Domestic Sales Manager has been announced by The Euclid Road Machinery Co., Cleveland, Ohio. Mr. Paape has been active in the construction industry for over twenty years. Prior to joining Euclid, he served with the Syracuse Supply Co., Caterpillar, and LaPlant-Choate.

Safety Engineer Retires

The retirement of George M. McAinsh has been announced by the American Mutual Liability Insurance Co. of Boston. Mr. McAinsh has been in charge of the company's safety engineering in the New York and New Jersey area. He was retired upon his own request after 27 years of service with the company.

His position will be filled by Everett A. Roberts, who has been the southern division's Engineering Manager. Mr. Roberts' former position will be filled by his assistant, Thomas R. Self.

TO ALL CONSTRUCTION SUPTS.
For Bigger Payload Performance
...the logical first choice is HAISS HI-POWER. Unique for Sta-in-line reeving, out-of-the-muck sheaving. Weight placed for highest digging power, with closing ratios up to 7:1. Write for facts.
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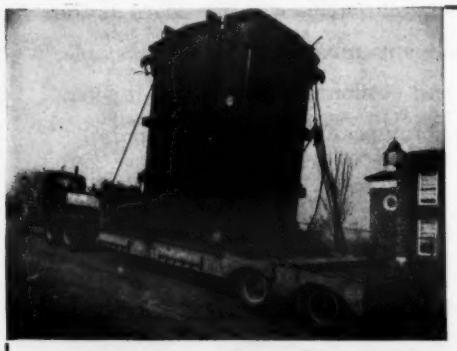

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The National Cancer Foundation
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Plans for constructing this rock-salt spreader for ice removal can be secured from the International Salt Co., its developer. Resembling a large salt shaker in design, it is inexpensive and easy to make.

Rock-Salt Spreader Handles Ice Control

A rock-salt spreader, inexpensive to make, has been developed by the International Salt Co., Inc., Adams and Thomas Sts., Scranton, Pa., Called the Sterling Rock Salt Shaker, it can be built quickly and simply, the company says, in any state, county, or township highway maintenance garage. Detailed plans for its construction are included in a pamphlet which may be obtained free of charge from the company.

It is designed to provide a controlled spread of rock salt for snow and ice removal. And it is made in such a way that it hooks over the tail-gate of a truck. It may be attached, removed, or changed from one truck to another without alterations, use of bolts, or other holding devices, explains International.

The spreader consists of a metal trough with a capacity of 250 pounds of rock salt. It has adjustable holes in the bottom through which the rock salt pours out onto the highway, a regulating handle to control the rate of flow through the holes, and hangers to fit over the tail-gate of the truck. If rock salt is shoveled into the trough instead of dumped in from bags, the back and sides should be built up higher than the front to avoid spilling when the salt is thrown from the shovel.

The spreader is hung as far as possible to the left side of the gate, so that it overhangs the center line of the road and distributes rock salt equally on both sides of the line. Because of that feature, the company says, the spreading truck needs to make only one trip down the highway during the average snow or ice storm to cover both sides.

When the spreader is set to one-half the maximum capacity of the openings, it applies rock salt at a rate of 300 to 400 pounds per mile of 20-foot pavement at a truck speed of approximately 15 miles per hour. Density of application may be regulated by changing the size of the openings with the regulating handle, or by increasing the speed of the truck.

After the desired feed opening has been obtained, it is unnecessary to use the regulating handle further. For that reason the handle has been placed at the outboard end of the spreader to avoid interference with trough-filling operations.

Further information may be secured from the company, or by using the enclosed Request Card. Circle No. 14.

C.I.T. Branches Expand

In order to improve its service in the Chicago area, the C.I.T. Corp. has found it necessary to occupy enlarged offices. These are located at 1 LaSalle St. Management will be under the direction of W. G. Cathcart, Vice President in charge of the Chicago regional headquarters.

In anticipation of increased construction activity, increased office space has also been found in Atlanta at 66 Luckie St., N.W. E. H. Mayer is Assistant Vice President in charge of the Atlanta offices of C.I.T.

The firm has also expanded the facilities of its southern California office, which is located at 416 W. 8th St., Los Angeles. R. S. Wallace will continue in charge of this office.

Packaged Clutch Has Wide Variety of Uses

A packaged clutch for use where various accessories must be operated through a clutch drive is now available from Marine Products Co., Industrial-Agricultural Division, 515 Lycaste Ave., Detroit 14, Mich.

This clutch is said to permit a number of drive combinations and consists of a clutch assembly contained in a bracket. A double extension shaft, as well as a double-groove pulley between the clutch face plates, provides various drive arrangements.

The clutch can be either direct-connected or V-belt-driven from any source of power, the manufacturer says. If direct-connected, both the extension shaft and the double-groove pulley can be used to drive separate accessories. If the clutch is V-belt-driven from its source of power, the two extension shafts can be used to drive accessories.

Large heavy-duty ball bearings are provided throughout the entire assembly; this permits operation at maximum speeds of 3,600 rpm. The rated capacity of this clutch is said to be 315 inch-pounds, or ½ hp per 100 rpm. The maximum recommended capacity is 10 hp. Four mounting slots are provided in the base for bolting the unit in place.

Further information may be secured from the company, or by using the enclosed Request Card. Circle No. 59.

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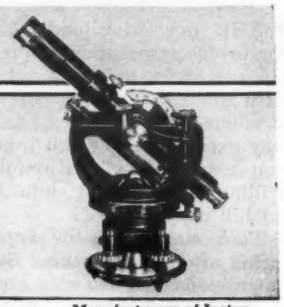

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Approach Graded For Potomac Bridge

Scrapers Move Dirt While Wagon Drills Bore Holes In Rock Cuts for Blasts; Shovel Loads Trucks

✦ THE new Maryland approach for the bridge across the Potomac at Sandy Hook is short, only 0.65 mile. But the excavation totaled 123,000 cubic yards, of which 107,500 cubic yards was roadway excavation. Of this a goodly portion was rock, which required much drilling and blasting into the heavy sidehill cuts.

Work started on the approach last spring after the Maryland State Roads Commission had awarded a contract to M. J. Grove Lime Co. of Lime Kiln, Md. That company's low bid of $184,-100.25 covered grading, drainage, and 24-foot reinforced-concrete paving from a point on U. S. 340 through new location to meet the abutment of the new bridge on the north bank of the Potomac at Sandy Hook, Md. (The term "new" bridge may not be entirely correct, in the strict meaning of that word. The two concrete abutments and thirteen piers have been sitting astride the Potomac since their completion in 1943 awaiting steel for the superstructure.)

This bridge is designed to replace the highway bridge that was washed out a mile upstream in the great flood of 1936. At that time the Potomac was spanned from the Maryland shore to Harpers Ferry, W. Va., where the three states of Maryland, Virginia, and West Virginia meet at the confluence of the Shenandoah and the Potomac Rivers.

The highway bridge across the Shenandoah, in West Virginia, was also washed out in the same flood and has yet to be replaced. But prompt action on the part of the Baltimore & Ohio Railroad saved the two parallel railroad bridges which cross the Potomac alongside and upstream of the highway bridge at Harpers Ferry. Heavily loaded trains of coal cars were run out on the bridges when the river rose, and the added weight prevented the superstructure from being swept away by the floodwaters.

The Maryland State Roads Commission was faced with the immediate problem of transporting highway traffic across the Potomac until such a time as a new bridge could be built to replace the washed-out span. The problem was all Maryland's, for the state line does not bisect the river as water boundaries usually run; instead, it is located along the south bank of the Potomac. However, it was able to make arrangements with the B & O Railroad for the use of one of its Potomac bridges to carry highway traffic as well as rail.

The older downstream truss bridge was converted to vehicular use by laying a plank flooring across the two tracks; these are used rather infrequently by the Valley Line, a short branch of the B & O. Maryland pays rent for this structure and also provides watchmen who close the bridge to vehicular traffic when a train wants to cross. This sturdy bridge providing dual service was erected after the close of the Civil War to replace the one destroyed by the opposing armies as they surged back and forth across this historic ground.

New Approach Road

The approach road to the old highway bridge, built about 30 years ago, has a 16-foot concrete pavement. It is much too narrow for present-day standards. And its steep grades and sharp curves present a tortuous alignment as it drops abruptly from the high ground around Weverton to the river valley below.

With the location of the new bridge further downstream so that the opposite bank is Virginian and not West Virginian soil, the approach is shortened considerably. The winding curves will also be eliminated by the high-level bridge which will pass over both the railroad and the old approach. Although the new section of U. S. 340 does not dip down to the valley level, it runs into some steep cuts in sidehill excavations; there the top of the slope in places is 54 feet above the centerline grade.

A 70-foot right-of-way was taken for the 0.65-mile improvement. The 24-foot reinforced-concrete pavement

(*Continued on next page*)

Everybody has commented on the really beautiful four color illustrations contained in the VICTOR Bulletin Form 20 . . . it covers fine welding and cutting equipment . . . it will be yours, free, for the asking. Write us today for your copy.

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ABOVE—*Laying a four-inch course of No. 1 rock with an Adnun. Rock passes 4-inch screen, retained on 2-inch . . . An extra, profitable job for any Adnun!*

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ALSO SEE PAGE 71

BUILDERS OF FOOTE KINETIC MIXERS, MULTIFOOTE CONCRETE PAVERS, AND ADNUN BLACK TOP PAVERS

Approach Graded For Potomac Bridge

(*Continued from preceding page*)

is of 9-7-9-inch cross section. In the fills, the shoulders are 13 feet wide, while in cuts they are 10 feet. In both cases shoulders are stabilized for 8 feet adjoining the pavement with a 5-inch stone-base course topped by a 3-inch macadam-surface course. The shoulders have a slope of ½ inch to the foot. For most of the contract, the cut slopes are 1 on 1, while the fills slopes are 1 on 2. In shallow cuts the slope is 1 on 2, and in shallow fills, 1 on 4.

The grading was a waste job. About 60,000 yards of material had to be disposed of either by widening the fills when at all possible, or dumping on private land. Some of this surplus material was used to good advantage by filling in an area on the east side of the bridge abutment for a park, which will provide visitors with an excellent view of the Potomac River Valley.

Drilling and Blasting

Clearing was done both by hand, with axes, saws, and machetes, and by a Disston power saw. In the sidehill work a Koehring ¾-yard shovel cut itself a path along the top of the slope, casting the overburden to one side until rock was reached. After this initial swath was made, the shovel backed out. Then drillers widened the cut by blasting. This made room for the shovel to go back in and dig out a rough road for trucks to follow and get loaded.

Rock drilling was done with two wagon drills, a Worthington and an Ingersoll-Rand, and three Worthington jackhammers; three Worthington 315-cfm compressors furnished the necessary air. The wagon drills were used to take out 12-foot lifts at a time. They drilled holes on an average of 6-foot centers, using 6-foot lengths at first, followed by 12-foot lengths of 1¼-inch round drill steel.

The usual practice employed 2½-inch bits all the way when drilling through shale, as this material had a tendency to chip off, fill up the hole, and choke a smaller-sized bit. When limestone was encountered, the bit size was reduced, as the hole deepened, to 2-inch. In the shale one bit drilled from 6 to 8 holes, or from 75 to 90 feet, before having to be replaced; only 3 holes of limestone could be drilled with a single bit before it had to be resharpened.

For 6-foot lifts or secondary blasting the jackhammers rendered good service; they used 2½, 4, and 6-foot lengths of 1-inch hexagonal drill steel. Bit sizes varied from 2 inches at the top to 1½ or 1¼ inches at the bottom of the hole.

In the 12-foot holes, from 12 to 15 sticks of American 40 per cent dynamite were loaded. To get the greatest effect from the charge, workers first split the casings on both sides so that the material spread and packed tightly in the bottom of the hole. The sticks used in the wagon-drill holes were 1½ x 8 inches and filled up half the depth; the upper 6 feet was tamped and backfilled. The size of the charge varied naturally with the type of rock being removed. In the 6-foot holes an average of 5 sticks, 1⅛ x 8 inches, were placed to a depth of about 30 inches, and the upper part of the hole was tamped. The number of holes shot at one time varied from 80 to 200.

C. & E. M. Photo
The location of a stream had to be changed to divert it from the approach which M. J. Grove Lime Co. graded for the new Potomac bridge. A Koehring ¾-yard shovel loads a Sterling 4-yard truck in the 45-foot cut.

Earth-Moving

From the rock cuts material was excavated by the Koehring ¾-yard shovel and loaded into four Sterling 4-yard trucks which hauled the rock an average of 800 feet. Dirt was hauled about

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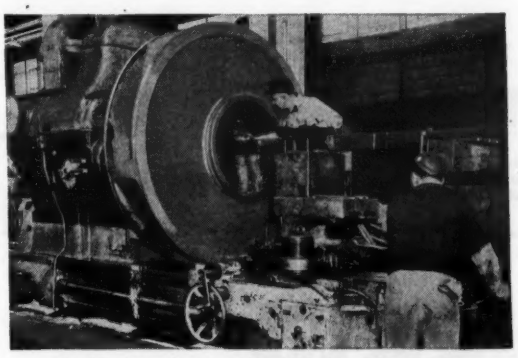
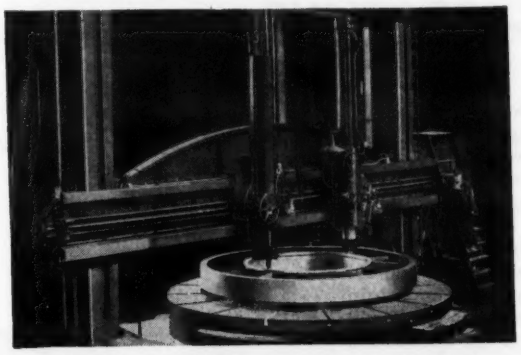
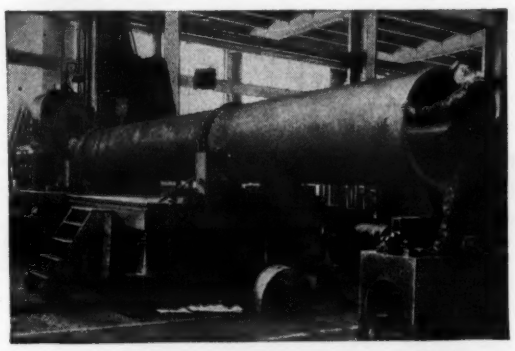


Cutting threads in an 88-inch dredge pump impeller. A typical "Federal" job resulting from years of experience in building dredging equipment.



Machining gear blank on vertical boring mill. Federal "know-how" is brought to bear on large and small machine parts of all types.



Boring dredge spud tube sleeve on horizontal boring mill. Modern machining techniques employed in Federal shops combine speed and efficiency.

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In whatever industrial category your fabrication requirements may fall, "Federal" is equipped to handle them. Dredges, dredge parts, breechings, boiler casings, floating structures, heavy machine construction and fabricated assemblies, kitchen and marine galley equipment are among the varied fabrication jobs performed every day in "Federal" shops.

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Approach Graded For Potomac Bridge

(*Continued from preceding page*)

the same average distance but with three scrapers, two Gar Wood 8 to 10-yard models, and one 7 to 9-yard Heil. The Gar Woods were pulled by Allis-Chalmers HD-10 tractors and the Heil by an Allis-Chalmers Model L tractor.

In rock cuts the excavation went down 9 inches below subgrade and was later backfilled with sub-base material for the pavement foundation. This sub-base material was also placed to a 6-inch depth at any location where soil conditions warranted its use.

In the high fills the rock was laid first in layers up to 2 feet thick, depending on the size of the pieces. The earth was spread on top of the rock to fill in the crevices. For the upper 6 feet, however, all layers, no matter what the material, were spread to 8-inch thickness by two Allis-Chalmers Model K tractors equipped with Baker bulldozers. A Galion 10-ton 3-wheel roller compacted the fills, over which the heavy equipment also rolled. The scrapers moved an average of 1,800 yards in a 10-hour day, while the trucks and shovel averaged from 350 to 400 yards.

Drainage on the new road is cared for through pipe ranging in size from 6 to 48 inches. The 6-inch pipe is used for underdrain; the smallest cross-drainage pipe is the 12-inch size. There is also one large culvert of reinforced concrete, 10 x 6 x 150 feet. The location of a stream had to be changed to divert it from the path of the new approach; it required a 45-foot cut at one point. Backfill over the pipe and culvert was tamped by Ingersoll-Rand pneumatic tampers to achieve good compaction.

As the main shop of the contractor is at Lime Kiln near Frederick, only 20 miles from the job site, no equipment-repair shop was set up at Sandy Hook. Fuel and lubricants were supplied by the Sinclair Oil Co. which kept filled a 500-gallon trailer tank for fuel oil. Equipment was greased daily with Alemite guns kept in a trailer van along with the required lubricants.

Quantities and Personnel

The M. J. Grove Lime Co. used a force of 25 men, including Superintendent Dillard House, in the following capacities: 2 foremen, 1 timekeeper, 5 equipment operators, 6 semiskilled workers as drillers and truck drivers, and 10 laborers.

The major items in the approach-road contract included:

C. & E. M. Photo
An Allis-Chalmers HD-10 pulls a Gar Wood scraper during earth-moving on the Maryland bridge-approach job. The pusher is an A-C Model K tractor with a Baker dozer.

Excavation	123,000 cu. yds.
Shoulder base course, 5-inch	6,750 sq. yds.
Macadam shoulder surface course, 3-inch	6,750 sq. yds.
Screenings for stabilizing shoulders	650 tons
Asphalt for shoulders (80 penetration)	18,225 gals.
Reinforced-concrete pavement, 9-7-9	9,280 sq. yds.
Reinforcing steel	34,500 lbs.
Concrete gutter, 5-inch	1,800 sq. yds.
Concrete for culvert	225 cu. yds.
Drainage pipe, 6 to 48-inch	1,354 lin. ft.

The Maryland State Roads Commission is headed by Wilson T. Ballard, Chief Engineer. T. M. Linthicum is Assistant Construction Engineer. Silas D. Kuhn was Resident Engineer on the approach contract, and D. S. Brown, Resident Engineer on the bridge construction.

New Caterpillar Managers

The appointment of two new divisional managers and their assistants has been announced by the Parts Department of Caterpillar Tractor Co., Peoria, Ill. The Eastern Division now has C. D. Byrns as Manager and B. J. Grimm as Assistant Manager. For the Western Division, the new Manager is Eldon L. Mason and the Assistant Manager is E. W. Ryder.

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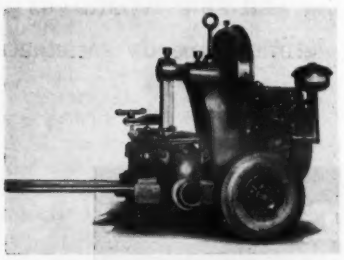

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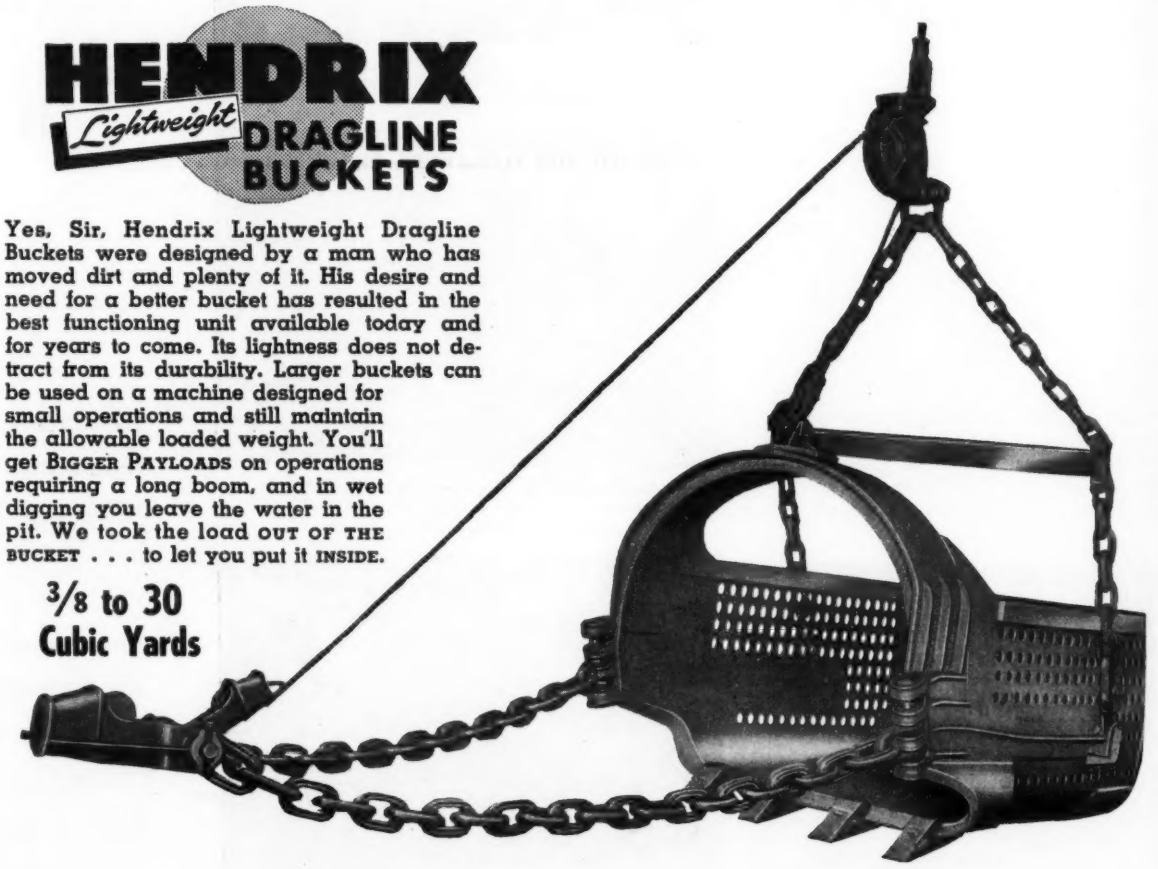

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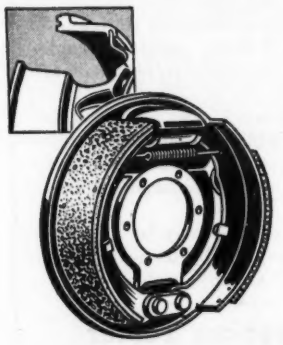

Ford

Bulk construction materials hauling is a field where Ford Truck stamina pays off in long life and low-cost maintenance. This heavy duty Ford Truck is equipped with a Fabco Dual Drive unit and a 6- to 8-yard dump body and hydraulic hoist by Anthony Co., Streator, Illinois.

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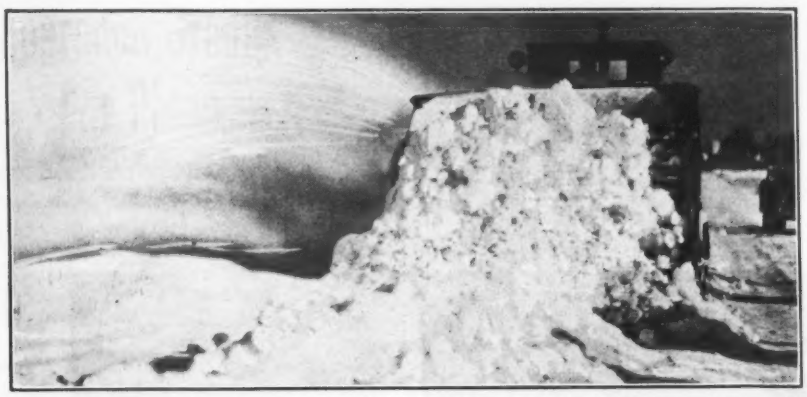

Equipped with a chain-driven endless-belt elevator and rotating fan, the new Pitcher Snow Mover, shown here, picks up and throws snow clear of the highway.

Snow Tossed Clear Of Road Shoulders

A new machine which picks up and throws snow clear of the highway is made by the Snow Pitcher Co., Box 25, St. Paul 5, Minn. This unit can also be used for loading snow into a truck.

The Pitcher Snow Mover picks up snow with a chain-driven endless-belt elevator, and deposits it into a rotating fan which pitches it from 40 to 100 feet, according to the manufacturer. By closing the pitching vent, snow is forced instead through the loading chute into trucks traveling alongside the mover. Power to operate the elevator and rotor is furnished by a 75-hp gasoline engine mounted on the frame.

The 60-inch-diameter rotor has six blades, 10 inches deep. The length of the unit is 14 feet; width, 8 feet; height, 6 feet; and total weight, with engine, about 8,000 pounds. The elevated loading chute used to dump the snow into trucks is 9½ feet high.

The machine is a complete unit, supported on 9 x 22 8-ply standard truck tires and wheels with roller-bearing axles, so that it can be towed to location by a light truck. In action, it is pushed by available equipment: a light grader, tractor, or a 3-ton truck are said to be adequate under most circumstances.

Further information may be secured from the company, or by using the enclosed Request Card. Circle No. 58.

Compression Tester

To aid maintenance men in checking the compression in diesel cylinders, the Bacharach Industrial Instrument Co., 7000 Bennett St., Pittsburgh 8, Pa., has brought out a new diesel compression tester. The unit is designed especially for checking compression pressures of diesels at cranking or idling speeds.

In testing the cylinder, the tester is held in place by the same means as the fuel injector. Therefore, attachment of the tester merely requires removal of the fuel injector from the cylinder to be checked, and insertion of the adapter fitting into the injector opening. A cartridge-sealed pressure check valve in the adapter fitting causes the pointer of the gage to swing gradually until maximum pressure is indicated. The pointer remains stationary when peak compression pressure is reached, permitting close reading. Depressing the push-button relief valve causes the pointer instantly to swing back to its atmospheric position. This feature permits taking compression readings in quick succession.

Further information may be secured from the company, or by using the enclosed Request Card. Circle No. 57.

Westinghouse Advancements

The advancement of two members of its sales department has been announced by Westinghouse Electric Corp., Pittsburgh. One of the positions, Industrial Syndicate Manager, has been created recently to coordinate industrial sales, and will be filled by C. B. Stainback. Mr. Stainback, formerly Manager of the Industrial Sales Department, has been with the company since 1910.

The position vacated by Mr. Stainback, will be filled by John E. Payne. Mr. Payne has been with the company since 1925, and previous to his present appointment was Manager of Industrial Sales for the Central District.

Takes Low-Altitude Aerial Photographs

The development of a camera for continuous-strip aerial photographs at low altitudes has increased the uses of this type of survey in highway work, according to a report by the Highway Research Board. It is said to be applicable to determining and locating highway right-of-ways, and to design, maintenance, and traffic operations.

The Sonne continuous-strip aerial camera was developed by the Chicago Aerial Survey Co., 332 So. Michigan Ave., Chicago, under Army and Navy auspices. Its ability to take clear pictures at unusually low altitudes permits larger scales than previously possible. The camera can take either flat or stereoscopic vertical photographs; the three-dimensional feature is said to permit photogrammetric measurements of the heights of objects with a high degree of accuracy.

The camera has no shutter; exposure is controlled by means of a slit. When the camera is in operation, the film moves in the direction of and at the same speed as the image in the local plane. The synchronization of image motion with film speed produces a motion-stopping effect.

Further information may be secured from the company, or by using the enclosed Request Card. Circle No. 56.

Data on Small Engines

A new 8-page brochure describing its Series No. 1200 industrial gasoline engines is announced by McCulloch Motors Corp., 6101 W. Century Blvd., Los Angeles 45, Calif. These 2-cycle die-cast engines range from 2½ to 4 hp.

Details on standard engines now in mass production are given. Also included is information on special engines which the company is prepared to design and mass-produce for a wide variety of customer applications.

Copies of this literature may be obtained from the company. Or use the enclosed Red Request Card. Circle No. 98.

Speed? Up to 11 Miles Per Hour Loaded

The OVERLAND SCRAPER

is perfectly matched to the performance of the Ford Tractor. This combination is setting a new high speed dirtmoving record in the small scraper field. Over two thousand in use today!

GREATER CAPACITY: Cut below illustrates hauling approximately 35 cu. ft. (heaped capacity).

Built for Use with the Ford-Ferguson Tractor and

Adaptable For Many Jobs

- Airport Maintenance
- Excavating for Buildings
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- Digging Trenches
- Snow Removal
- Building Roads
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- Lumber Camps
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For further information please write.

Manufactured By

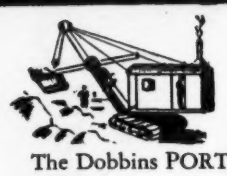
WESTERN EQUIPMENT MFG. CO.

P. O. Box 105 **Glendale, California**

Clean Cool DRINKING WATER

PORTABLE SANITARY

MEETS REQUIREMENTS OF PUBLIC HEALTH AUTHORITIES



FOR CONSTRUCTION AND MAINTENANCE CREWS

The Dobbins PORTABLE SANITARY DRINKING FOUNTAIN protects the health and strength of workmen on any job . . . anywhere . . . with cool, clean drinking water—at the press of a button! Aids railroad, highway and building construction, repair and maintenance crews . . . miners, and all other workmen on jobs where a permanent, sanitary drinking water supply is *not* available. Banishes germ-spreading practices such as use of "common" drinking cups, open pails, dippers, etc. Four gallon capacity tank is fully insulated. Air pressure for instant flow of water is supplied with a few strokes of the pump.

DOBBINS MANUFACTURING COMPANY

DEPT. 423, ELKHART, INDIANA

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No. 18 — Dobbins Superbilt *Portable Drinking Fountain* less all accessories. Only **$16.00**

Salt Tablet Dispenser, 500 tablet capacity, extra **$2.75**

Adjustable, Waterproof *Carrying Strap*, extra **$1.15**

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Mounting Bracket, holds fountain to wall or floor of buildings, trucks, tractors, locomotives, etc. . **$4.50**

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Dobbins Superbilt PORTABLE DRINKING FOUNTAIN

Traveling Plant Mixes Materials for Base Course

Gravel and Clay Hauled To Road, Windrowed, and Mixed to Stabilize Base Course on 7.9-Mile Job

✦ A TOTAL of 60,000 tons of aggregate was used for the new stabilized base course and bituminous surfacing over 7.9 miles on Trunk Highway 100 between Robbinsdale and New Brighton, Minn. And more than half of this aggregate was hauled an average of 10 miles to the job. Two pits, one at each end of the project, were equipped with complete crushing units and facilities to provide the aggregate. Two other pits with dragline, conveyor, and vibrating screen furnished the 6,000 cubic yards of clay used for binder in the stabilized base course.

T. H. 100 is the Belt Line Highway for heavy and through traffic which encircles the Twin Cities of Minneapolis and St. Paul. For most of its distance about the outskirts and through the suburbs of the cities it is a bituminous or concrete-surfaced 6 to 8-lane road, with opposing lanes of traffic often separated by an island. One of the few sections of the Belt Line which had remained unsurfaced was the short graveled stretch between Robbinsdale and New Brighton.

Bids for stabilized base course and bituminous surfacing over this 7.9-mile distance were received last summer by M. J. Hoffmann, Minnesota State Highway Commissioner. And the contract for the work was awarded to Barton Sharretts Co., and Otto Braske, St. Paul, on their low bid of $91,463. Principal quantities involved were 60,000 tons of crushed rock for base course, bituminous surfacing, and subgrade correction; 6,000 cubic yards of clay binder material; and 200,000 gallons of MC-2 and SC-3 for bituminous surfacing.

Shaping the Grade

Initial work on the project was started on August 5, 1946, under the direction of Eugene Barton, who was in charge of the contract for Barton Sharretts Co., and Otto Braske. For about 6,000 feet of the project, the gravel-surfaced highway consisted of two 31-foot lanes separated by an island. The remainder of the road merged traffic in a gravel-surfaced lane 40 feet wide.

The contractor placed an Austin-Western, two Galions, and a Caterpillar No. 12 motor grader on the road to windrow the gravel to one side and shape the grade in preparation for base-course stabilization. Frost boils and ruts along the old road gave indication of unstable subgrades in several areas, and before the base course was placed, about 2,000 cubic yards of unsuitable material was excavated from the roadbed. The backfill material used was gravel.

Gravel and Clay Pits

As the motor graders worked over the existing grade, Barton Sharretts Co. and Otto Braske were setting up their crushing units in two gravel pits, one at each end of the job. At a pit located at the edge of New Brighton, a Cedarapids 16 x 24 crusher started production of 27,000 tons of ¾-inch material; it ran an average of between 90 and 100 tons an hour. The average haul from this pit, in charge of L. Googemos of Hudson, Wis., was 3 miles. The hauling units were 12 to 15 Chevrolet and Ford dump trucks hauling 7-ton loads.

The second gravel pit, from which the bulk of the gravel and crushed rock was removed, was located 7 miles northwest of the Robbinsdale end of the project. The average haul from this pit to the job was 10 miles. In this pit, in charge of Don Richardson of Minneapolis, was a new Universal crusher with 16-inch rolls and 24-inch jaws, powered by a Caterpillar D8800 power unit. It turned out an average of between 90 and 100 tons an hour. A Buckeye ¾-yard shovel loaded directly to the 6 x 8 grizzly at the crusher. A Caterpillar D8 and bulldozer worked in the pit dozing down the sides and generally speeding up operations. Loads leaving the pit were weighed on Fairbanks scales.

The long average haul of 10 miles from this pit was solved by supplementing the 7-ton dump trucks with five semi-trailer frames carrying heavy dump bodies. Four Federal and one Mack unit were used with Fruehauf semi-trailers. Galion all-steel dump

(*Concluded on next page*)

C. & E. M. Photo

This Lima ¾-yard dragline loaded clay to a hopper at the clay-binder pits used by Barton Sharretts Co. and Otto Braske of St. Paul on their 7.9-mile project. Here a truck is shown loading at the vibrating screen.

A NEW LOW BED COST

TILT TRAILER

25 TONS CAPACITY

LOADING D-8 TRACTOR

IMMEDIATE DELIVERY

D-8 TRACTOR LOADED IN THREE MINUTES

1. No dangerous and heavy skids to carry or break under heavy loads. Tilting deck becomes RAMP for equipment to load.

2. ONE MAN LOADING. Being perfectly balanced the WRIGHT TILT TRAILER is easily coupled, driven and loaded by one man.

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WRIGHT TRAILER COMPANY

750 New High Street — Manufacturers of Commercial Trailers — Los Angeles 12, Calif.

TELEPHONE: Michigan 1564

Traveling Plant Mixes Base-Course Material

(*Continued from preceding page*)

bodies mounted on the Fruehaufs carried average loads of 11 tons of aggregate. Round-trip time from pit to job for each of these heavy hauling units was about an hour.

The 6,000 cubic yards of clay used for binder was taken from two pits, one at each end of the project, with an average road haul of about 4 miles. In these pits, a Lima ¾-yard dragline loaded to the clay hopper. The binder material was conveyed to the Simplicity vibrating screen and loaded directly to the Ford, Chevrolet, and International trucks which carried 5-cubic-yard loads. L. Berger was in charge of the clay pits for the contractors. Average clay production was between 25 and 30 cubic yards per hour.

Stabilized Base Course

After the aggregate was dumped on the road, it was windrowed to the side by one of the motor graders. When the clay was spread, it was cut into this gravel windrow. In order to get even clay distribution, it was dumped on the grade through a spreader box. The proportion of clay binder material varied from 12 to 13 per cent due to variation in gradation of the gravel.

The density of the stabilized base course was controlled according to the Proctor curve, and the stabilizing material was mixed at 9 per cent optimum moisture. Water obtained from the municipal sources at New Brighton and Robbinsdale was hauled in a 3,700-gallon tank on a Federal 2½-ton semi-trailer, and in a 1,300-gallon tank on an International 2-ton truck.

Mixed in Traveling Plant

A Jaeger traveling plant averaged 120 tons per hour mixing the ¾-inch aggregate with the 12 per cent and 13 per cent clay binder for the stabilized base course. As finally stabilized, the grade has a base course which varies in thickness from 3 inches to 9 inches. Where the subgrade was weak, three lifts of 3 inches each of compacted and stabilized material were spread. At some areas two 3-inch lifts were required for stabilization, while over approximately two-thirds of the job, one 3-inch lift of stabilized material was considered sufficient. Compaction at each lift was obtained with a Cemco Flat-Iron pneumatic-tire roller drawn by a John Deere tractor, and a Bros pneumatic-type roller drawn by an Allis-Chalmers 20-hp tractor.

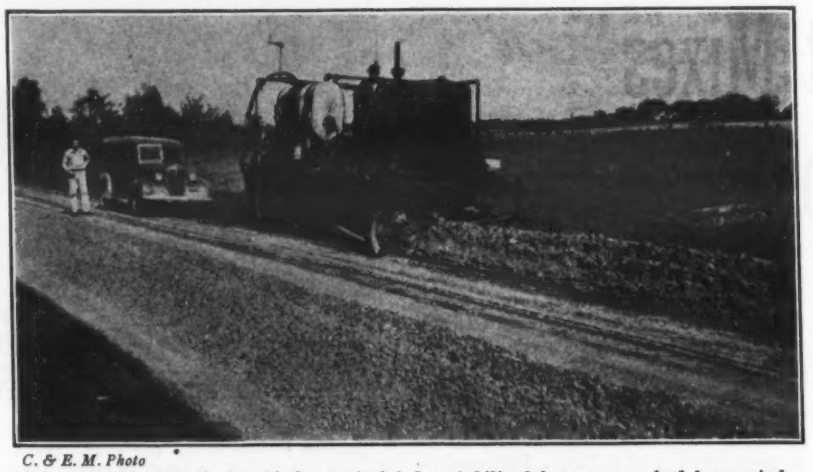
Bituminous Surfacing

Over most of the project, bituminous surfacing was laid 24 feet wide. The bituminous mat required 10,500 tons of aggregate, applied at the rate of 150 pounds of aggregate per square yard with 4½ per cent oil by weight. The mix was run through a Barber-Greene 848 traveling plant.

Personnel

The contractor employed between 40 and 50 men on this project, running a full crew 11 hours a day for 6 days a week. About 20 men on the road crew worked Sundays. The project was started August 5 and completed late in the fall after heavy rains repeatedly delayed operations.

Project Engineer for the State Highway Department was D. T. Burns of Minneapolis; H. E. Chard is District Engineer. Eugene Barton was in charge of operations for Barton Sharretts Co. and Otto Braske. Don Richardson of Minneapolis was in charge of one gravel pit, and L. Googemos, Hudson, Wis., superintended work at the other. The clay pit was in charge of L. Berger of Minneapolis. Senior Inspector on the project for the State Highway Department was Henry Arneson of Minneapolis.



C. & E. M. Photo

When aggregate and clay binder material for stabilized base course had been windrowed on each side of Minnesota's T. H. 100 by motor graders, they were run through this Jaeger traveling plant for thorough mixing.

No field shop or office was maintained on the job since it was within hailing distance of the home office and yard at St. Paul.

Dragline-Bucket Catalog

A special basket-type dragline bucket is described in a catalog now made available to our readers by Yaun Welding and Dragline Buckets, Inc., Box 1508, Baton Rouge, La. It differs in construction from standard units in that it has an open-work shell, rather than a solid steel-sheet shell.

This type of bucket is designed for handling any loose material except excessively wet, thin "soup". The manufacturer claims that when it handles wet dirt, there is no suction to hold back discharge. The bucket is fully equipped with American Manganese steel fittings including tooth bases with removable tooth points; the cutting edges of the bucket are Stellited.

The catalog diagrams all the component parts of this bucket and specifies the sizes in which it is available. It also covers solid steel shell-type buckets.

Copies of this literature may be obtained from the company. Or use the enclosed Red Request Card. Circle No. 95.

CLEAN-CUT SMOOTH WALLS are characteristic of Parsons trenches. Hand trimming is unnecessary. Parsons arched-frame construction prevents cave-ins by putting crawlers on solid ground, well ahead of buckets.

POWER TO DIG DOUBLE TRENCHES is built into the 310 Trenchliner. It will handle two bucket lines, dig a 6' box sewer at one pass. With short and long boom, it can dig step trench in single operation.

CUT WITHIN 10" of fences, trees, buildings, with Parsons Ladder Trenchliner (221 illustrated). Off-set boom, shiftable across the full width, lets Trenchliner sidestep obstructions.

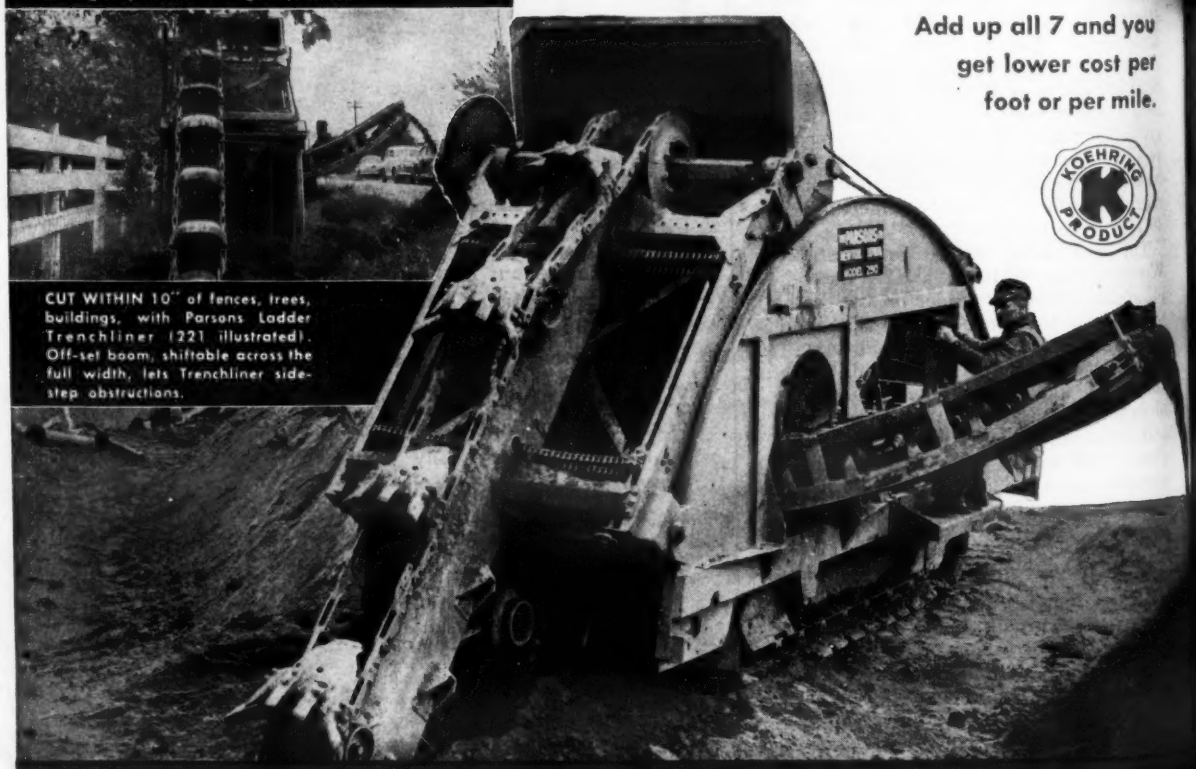
PARSONS

7 Outstanding Trencher Improvements
All originated and developed by Parsons

1. **Ladder Boom Shifts from Side to Side** . . . it shifts easily, smoothly, because, on Trenchliner, it rides on rollers.
2. **Ladder Boom Telescopes** . . . Digging depth is quickly changed. Telescope locks securely at points of adjustment.
3. **Conveyor Deposits to Either Side** . . . Shifts easily and quickly. Arc makes it easy to reach up over truck bodies.
4. **Power Flow Simple, Direct** . . . gets maximum power to the digging end. Easy to control, simple to maintain.
5. **All Gears Completely Enclosed** . . . machine-cut gears, alloy shafts, in one closed case, in continuous oil bath.
6. **Shovel Type Crawler** . . . Each individual shoe strong enough to carry entire load of Trenchliner. Self-cleaning.
7. **Trenchliner Frame is Arched** . . . Improves digging and travel balance. Distributes weight on solid ground, well ahead of buckets.

Add up all 7 and you get lower cost per foot or per mile.

KOEHRING PRODUCT



PARSONS COMPANY NEWTON, IOWA
KOEHRING SUBSIDIARY

Bulldozer Mechanism Gives Parallel Lift

A line of bulldozers for International wheel-type tractors is manufactured by Contractors Machinery Co., Inc., Clinton St., Batavia, N. Y. Some of the features of the Trojan line are the patented parallel-blade-lift mechanism, traction-aid mounting, and single-valve hydraulic control.

The parallel lift is designed to raise the blade in a straight line and maintain a vertical position throughout the lifting range. This device is said to prevent digging in and consequent stalling and wheel slippage. The traction-aid mounting is designed to add to the tractive ability of the unit when working under load. Another feature claimed for this type of mounting is that it leaves the rear end of the machine free of all obstruction, thus permitting installation of a rear power take-off whenever desired.

Three models are available, designed to fit the I-4, I-6, and I-9 series of International wheel tractors. Combination equipment available includes reversible one-way snow plows for the I-4 and I-6 series, and a V-type snow plow for the I-6 and I-9 series.

Further information may be secured from the company, or by using the enclosed Request Card. Circle No. 55.

The new line of Trojan bulldozers for mounting on International wheel tractors is designed for year-round service. Here a unit is seen in winter-maintenance service on a highway in New York State.

McKenty Joins Heil

The appointment of Gorden Stuart McKenty as Merchandising Manager of its Road Machinery Division has been announced by The Heil Co., of Milwaukee. Mr. McKenty formerly was with LeTourneau.

Twin Tunnels Boring Under River in N. Y.

(*Continued from page 2*)

tions. The first operation was the boring through of the pilot tunnel with a bottom heading. This permitted cheaper and faster removal of rock and the minimum requirements of roof supports. It was done from north to south. Afterwards the direction of work was reversed and the second operation of enlarging the tunnel to full cross section was begun, starting at the south end of the contract and working north.

When the project was visited in December, 1946, for CONTRACTORS AND ENGINEERS MONTHLY this second step was in progress. After the tunnel is enlarged back to the gorge in the rock, a shield will be assembled in the construction shaft. It will be moved south through the tunnel while the roof is trimmed under the shelter of the hood and the cast-iron lining set in place. Compressed air will be used with the shield when the soft ground is reached. But the remainder of its progress will be in free air. When the shield reaches the southern limits of the contract, the third operation will be completed and all the rings will have been erected.

Enlargement Drilling and Blasting

Ten drills are mounted at a time on the big drill carriage or jumbo used to enlarge the pilot tunnel. Four of these are strung across the top platform to drill for the excavation above the pilot tunnel, and three are mounted on each side for the widening cut. Most of the drilling is done with Ingersoll-Rand DA 35 drifters, 3½-inch size, with the occasional use of 4-inch I-R DA 505 drifters. As the rock is fairly soft, the smaller size is favored as easier to handle and adequate for the job.

Drill steel in 3-foot lengths is used at the start of a hole and is increased to 5, 7, 9, and 11-foot lengths in order to get a 10-foot depth. Forged bits, an integral part of the drill shank, are used. Drillers start off with a 2-inch size on the first length of steel and decrease sizes by ⅛ inch for every length that is added. As all the blast holes are made by wet drilling, both shanks and bits are bored through the center with a small hole for the passage of water. Bits average from 2 to 5 holes before they have to be sharpened.

With the drifters mounted on columns, easy maneuvering for the drill pattern is possible. In a drill round for an average enlargement, between 50 and 60 holes are made, using delays from 1 to 5 with no instantaneous exploders. While the neat outside diameter of the tunnel is 31 feet, the pay-line for excavation is 9 inches beyond the neat line.

In the contractor's field office the neat line of the tunnel is cut into a blackboard and the cross section from the previous blast is superimposed in chalk. Thus the superintendent and blasters can see at a glance the amount of overbreakage or "tights" produced by their last blast. In the tunnel a theoretical center hub is fixed on the jumbo and a 16-foot radius is swung touching the top and sides with a paint line for the drillers to follow.

Line holes for the drilling are made 3 inches inside of the pay-line averaging 2 feet on centers. At the bottom on the sides No. 1 delays are used, advancing to No. 5's at the top of the tube. Two other lines of relief holes are usually needed, depending on the amount of rock to come out. The holes are filled with du Pont 40 per cent dynamite. About 650 sticks are used per charge, set off by du Pont electric blasting caps equipped with 16-foot lead wires. About 2½ pounds of powder are re-

(*Continued on next page*)

TRENCHLINERS*

*Reg. Trademark

MILE-A-DAY TRENCHING PLUS BETTER TRENCH-BOTTOM GRADE CONTROL. Parsons new 200 Wheel Trenchliner, designed especially for pipeline work, farm and railway drainage, can step along at a mile-a-day pace, digging a 5'-6" trench 15" to 26" wide. Fine grading of trench bottom, important in pipeline and drainage work, is greatly simplified by the more flexible "Double Pivot" mounting of the husky wheel.

KWIK-MIX
Bituminous
MIXERS

End Discharge Speeds Patch Work

Patching is easier with Kwik-Mix non-tilting end discharge bituminous mixer. You need no wheelbarrow, because you pour mix direct from the mixer to the grade. Available in 10 and 14 cubic foot sizes. Kwik-Mix also builds a complete line of high quality cement, plaster and mortar mixers.

JOHNSON
Twin Silo
BULK CEMENT PLANT

1550 Barrels Capacity, Yet It's Portable

Johnson Twin Silo bulk cement plant, stores as much as 1550 barrels of cement, yet is fully portable. Easily erected and dismantled, because it's all-welded.

OTHER SIZES:
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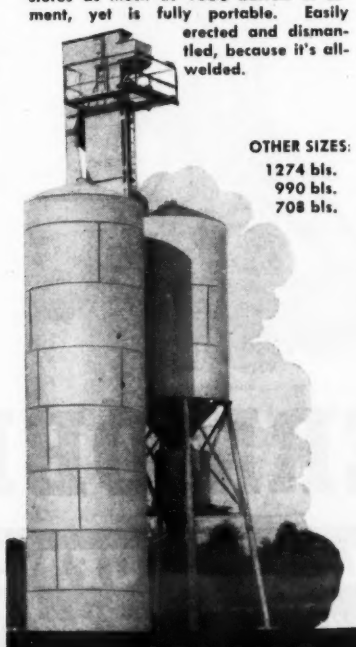


KOEHRING
for
PULL SHOVELS

Wide Trenches Need No Shoring

When soil conditions call for wide trenches, when rocks and boulders make use of trencher impractical, check on Koehring Pull Shovels. Available in ½ yard, ¾ yard and 1½ yard sizes. Fully convertible to shovel, crane or dragline when trenching job is done. Heavy-Duty.

Twin Tunnels Boring Under River in N. Y.

(Continued from preceding page)

quired to dislodge 1 cubic yard of rock.

The holes are stemmed with Heitzman wood and rubber blasting plugs which eliminate sand tamping and confine the explosive gases to the hole. Since the direction of the blast is towards the center of the tunnel, the jumbo has to be rolled back only about 25 feet to remove it from the path of the flying rock. If any large boulders result from the blast, they are blockholed or mud-capped to permit easier excavation.

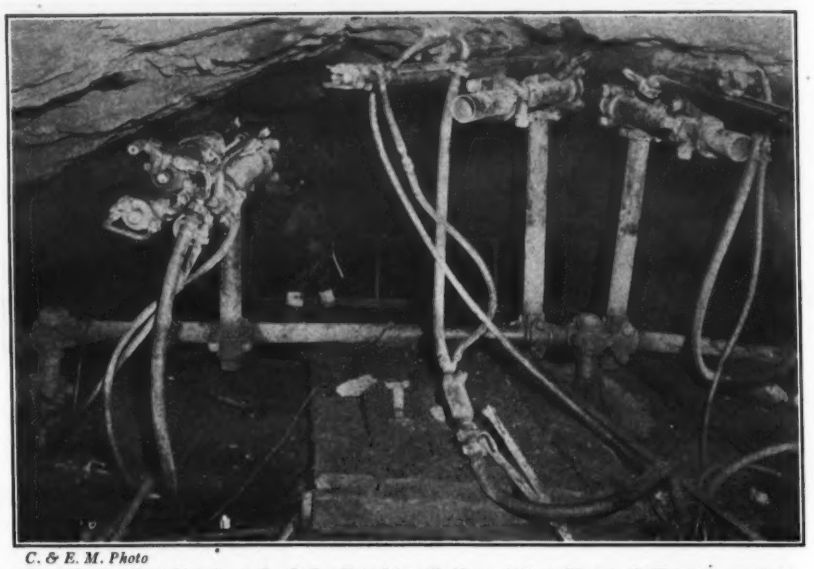
Tunnel Excavation

After the blast a sliding platform that frames under the drill carriage is pulled out and scalers with long bars work from the upper deck to dislodge any stone that might be clinging loosely to the roof of the tunnel. These scaling bars are pipe sections with pointed tips. A Conway mucker then attacks the pile of rock, or muck.

Four Conway muckers are on the job. One works in each tunnel with another held in reserve further back on a siding where it receives a daily overhauling and grease job. The muckers have a ½-yard bucket on an 8-foot boom, down which the material slides to the foot of a conveyor belt. This moves the muck to the rear and elevates it so that it can be discharged into muck cars which are coupled to the excavator. A 75-hp electric motor mounted on the mucker furnishes the operating power from a 440-volt line.

To prevent the pile of rock from spreading out all over the tunnel floor as the mucker advances on the narrow-gage track, a steel plate is lowered from the jumbo to ground level. The rock from the blast piles up against this for easy handling. While the mucking is going on, a couple of carpenters check over the jumbo, making any repairs from damage due to flying rock. An average of 600 yards of excavation, place measurement, is taken out of the two tunnels by both muckers each day of 24-hour round-the-clock operations. The material removed has about a 60 per cent swell to it. So for every linear foot of tunnel nearly 20 cubic yards of rock, loose measurement, is removed in the enlarging operation.

The Conway mucker loads the excavated material into side-dump muck cars, 8 feet long x 4½ feet wide x 4 feet high; each carries from 4 to 5 cubic yards of rock. For continuous operation 5 cars are in use for each mucker. While one is being filled at the mucker, two are dumping at the shaft, and the remaining two are in transit. The cars are pulled by 10-ton electric locomotives of which there are 10 on the project, 8 Whitcomb and 2 Goodman, driven by Exide TL M 31 56-cell storage batteries. Two units are used on the steeper grades to pull the 2-car trains.



C. & E. M. Photo

To enlarge the pilot tunnel of the Brooklyn-Battery tubes, Mason & Hanger used 10 Ingersoll-Rand DA-35 3½-inch drifter drills mounted on a drill carriage or rolling jumbo; 4 on the upper deck, 3 on each side. In the background, scalers working from another rolling platform pry loose cracked rock before mucking begins.

Since only a single track leads up to the heading where the mucker is working, the full cars are replaced with empties by means of a cherry picker. This is a gantry which straddles the track and is equipped with a Silent Hoist, operated by a 25-hp electric motor, which lifts an empty car clear of the track by four hooks on cables so that the loaded cars can pass.

A loading cycle runs like this: while one car is coupled to the mucker getting filled, two others are dumping at the shaft, and the remaining two empties are being returned to the heading by the locomotives. The cherry picker lifts the last of these empties clear of the track while the locomotive runs through to the heading, picks up the now-loaded car, and passes under the cherry picker again. Then the gantry drops the empty it was holding back onto the track. The locomotive pushes this empty up to the mucker and

(Continued on next page)

USE RIGHT BUCKET FOR THE JOB

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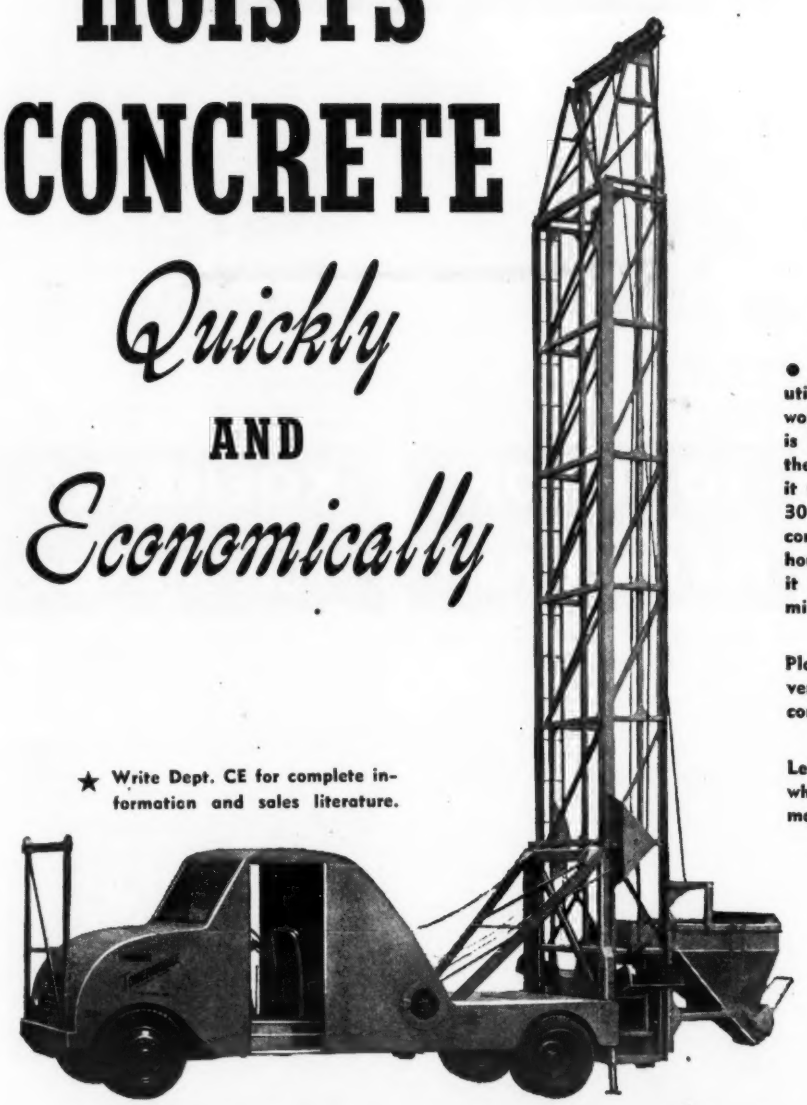

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Let us show you how and why Towermobile will make money by saving you costly labor and time.

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Twin Tunnels Boring Under River in N. Y.

(Continued from preceding page)

returns to the cherry picker, which raises the other empty into the air while the locomotive returns to the mucker for the second full car. After the train goes under the cherry picker once more, the second empty is dropped onto the track. The locomotive pushes it to the heading and then hauls the two full cars to the shaft while the loading continues at the mucker.

These operations are carried on smoothly and efficiently, with no cessation, in a continuous loading cycle. The distance from the cherry picker to the mucker is never more than 50 to 75 feet. At the shaft a double track and switch permits quick unloading and shifting of the cars so that no time is lost in getting them back to the cherry picker and heading.

The side-dump cars are tilted by an air jack for speedy unloading into a battleship bucket, which is then lifted to the top of the shaft by an American 35-ton stiffleg derrick having an 85-foot boom. Two such derricks operated by Lidgerwood 3-drum hoists were set up at the top of the shaft, one for each tunnel, for hoisting the buckets and emptying them into a muck bin. A single Mack 12-yard truck drives beneath the bin hopper and hauls the rock a few hundred feet to a stockpile at the edge of the job site.

A subcontract for removal of the rock was awarded to the Andrew Gull Corp. of Flushing, N. Y., which hauls the material away during the day shift. A Lorain 1½-yard shovel loads the muck into a fleet of 16 Mack 12-yard trucks which carry it to several dumping areas in the Borough of Queens at Astoria, Flushing, Maspeth, and also the LaGuardia Airport. Haul distance averages 10 to 15 miles.

Three shifts of workers are used in these operations which are in continual progress for 6 days a week. Drilling averages one hour. It is followed by 45 minutes of loading the holes with explosives and blasting the charge. A wait of ½ hour is required for the smoke and fumes to clear out, after which mucking is started and continued for an average of 4 hours.

Pipe Lines

Many pipe lines are strung along the sides of the tunnel. All of them are vital to the construction operations. On one side the air ventilating pipe is carried; in the west tunnel the pipe is 24-inch while in the east tube the air pipe is 30-inch diameter. Two Ingersoll-Rand combination blower and exhaust fans, equipped with a cross connection so that either direction of air may be employed, were set up at the top of the shaft and hooked up to the ventilating pipes which lead to each heading. With this equipment 12,000 cfm of fresh air is supplied to each heading.

On the other side of the tunnel a 6-inch air line furnishes compressed air. Also, a 3-inch water main furnishes water for the drifters, to wet down the muck while excavating. Later on when the ring is being installed, the main will furnish water to wash off the cast-iron segments before they are set in place; it will also be used for future grouting operations.

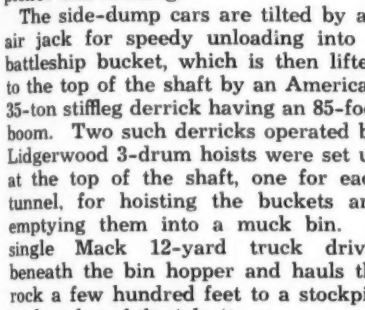
Above the water pipe line a 3-phase 4-wire power system at 440 volts was strung to furnish electricity for the Conway mucker, the hoist on the cherry picker, and discharge pumps. Transformers within the tunnel step this current down to 110 volts for a lighting circuit which is also strung along the side for the length of the tunnel. A 50-watt bulb is hung at 16-foot intervals. The electric lines are strung on small dowels driven into holes drilled in the rock walls. The heavier pipe lines are suspended on wire hanging from 2-inch steel dowels inserted about every 20 feet along the sides of the tunnel.

Drainage water at the heading is collected in sump holes from which it is pumped by Ingersoll-Rand 2-inch air

(Continued on next page)

C. & E. M. Photo

Supervisory and job personnel on the Mason & Hanger Brooklyn-Battery Tunnel contract includes, from left to right, Guy W. Sackett, Jr., Resident Engineer; John A. Ury, General Superintendent; Allan B. Lincoln, Job Manager; Frank Slipp, Electrical Superintendent; and E. S. Jermyn, Master Mechanic.



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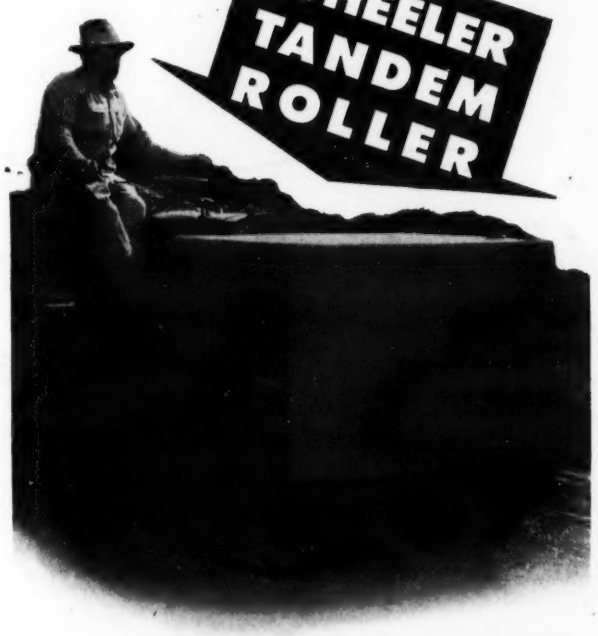

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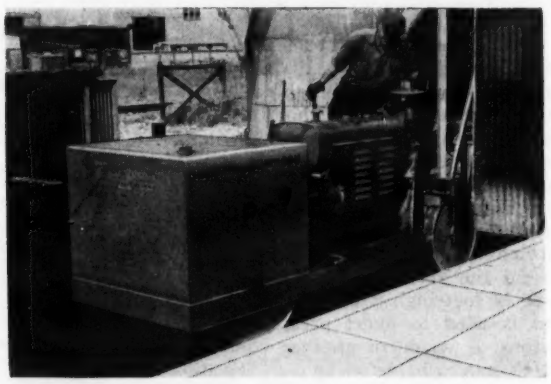
DIMENSIONS: Length—10' 7". Width—3' 6" Height—3' 11".
COMPACTION ROLLER: Width—36". Diameter—37".
STEERING ROLLER: Width—34". Diameter—27".
POWER: 4 cylinder, 1400 R.P.M., industrial gasoline engine, with 2 forward and 2 reverse speeds. Transmission: First (forward and reverse)—2.5 MPH. Second (forward and reverse)—4.5 MPH.
SPRINKLER SYSTEM: Gravity type. Tank capacity—45 gals.
COMPRESSION PER LINEAL INCH: Compaction roller—150 lbs. with ballast. Steering roller—70 lbs. with ballast.

CLOSE FINISHING is possible because frame extends only 1½ inches past left side of roller.



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Twin Tunnels Boring Under River in N. Y.

(*Continued from preceding page*)

pumps to a 6-inch discharge line. LaBour electric pumps force the water back to large sump holes at the foot of the shaft. From here the water is pumped up the shaft and into the river; three LaBour pumps—6, 3, and 2-inch units—are set up at the large sump.

Power Plant

The heart of the project lies in the powerhouse which supplies the air, light, and power to keep the wheels moving and the sand hogs working. The 60 x 100-foot corrugated-metal building with steel trusses and concrete floor was erected a short distance from the tunnel shaft. Three different sources of supply furnish power at 13,800 volts through three different lines, although only one line is necessary to carry on all operations. Three transformers at one end of the plant step this voltage down to 2,300 at which voltage the compressor motors operate, while other transformers reduce the power further to 440 volts for operating the tunnel equipment.

On one side of the room are three Ingersoll-Rand compressors which supply compressed air when conditions require the tunnel work to be done under pressure. Each unit has a capacity of 5,400 cfm of free air at 50 psi, and is driven by a G-E 625-hp motor at 180 rpm. Across the room are two high-pressure air compressors for driving the various pieces of tunnel and maintenance equipment. Both units, a Sullivan and a Chicago Pneumatic, are 2-stage compressors with a free-air capacity of 2,700 cfm at a pressure of from 100 to 125 psi. Each is driven by a G-E synchronous 500-hp motor at 180 rpm. They are automatically controlled to begin operating when the load demands more air. But they are also mechanically controlled from a switchboard in front of the three bank transformers.

In another portion of the room the hydraulic accumulator is ready for service when the shield is used. The air for the accumulator is stored in a tank 14 feet high x 5 feet in diameter and is used to exert pressure on 36 gallons of water in another container which moves a piston on a 38:1 ratio. Pressures from 1,500 to 5,000 psi are possible; but they are not required as the maximum working pressure of the shield is 4,500 psi and a pressure of 4,000 pounds is thought to be sufficient for this tunnel.

The water under high pressure is carried to the shield jacks from the accumulator in steel double-X hydraulic pipe having a 1½-inch OD and ⅞-inch ID. The threads are machined here on the job with high-speed-cutting steel tools. When the shield is reached, the water is conducted from the control-valve blocks to the individual jacks through high-strength flexible copper tubing with a 13/16-inch OD and 5/16-inch ID.

Shield and Rings

The shield was fabricated by the American Locomotive Works at Dunkirk, N. Y., and was shipped in nine sections to the contractor's yard at the job site. When ready for use, the sections will be lowered to the bottom of the shaft and assembled to begin the roof trimming and lining operations. The shield is 18 feet 4 inches long from the tip of its projecting 4½-foot hood, which will furnish protection during the roof trimming, to the end of the 7-foot tail, which is long enough to cover 2½ rings of lining. Made of steel plate, the shield has diameters of 31 feet 8 inches outside, and 31 feet 2 inches inside, with a 3-inch skin plate. It weighs 200 tons without the cutting-edge castings or the 28 Watson-Stillman 200-ton hydraulic propelling jacks. These jacks weigh 1½ tons each. They will move the shield 32 inches at a shove through their 10-inch x 40-inch-stroke pistons.

Work with the shield is expected to start this month, and the contractors estimate that the lining in both tunnels will be completed early in 1948. They hope to average from 12 to 16 rings in each tunnel per day.

Ring segments are also accumulating over old Battery Park, the material supplied by the Bethlehem Steel Co. and Davies & Thomas, Inc., both of Pennsylvania. In order to try out a new pneumatic bolt tightener, a complete ring from one to three segments long was assembled in the yard. The 31-foot-diameter ring is made up of 15 pieces—12 "A" segments and 2 "B" segments which frame on either side of the single "key" segment which fits into the top of the ring. A lighter sec-

(*Concluded on next page*)

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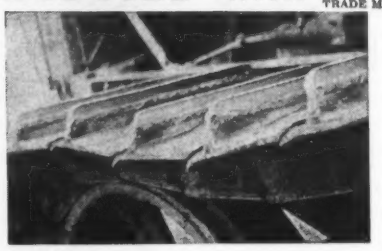

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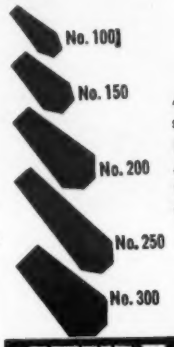

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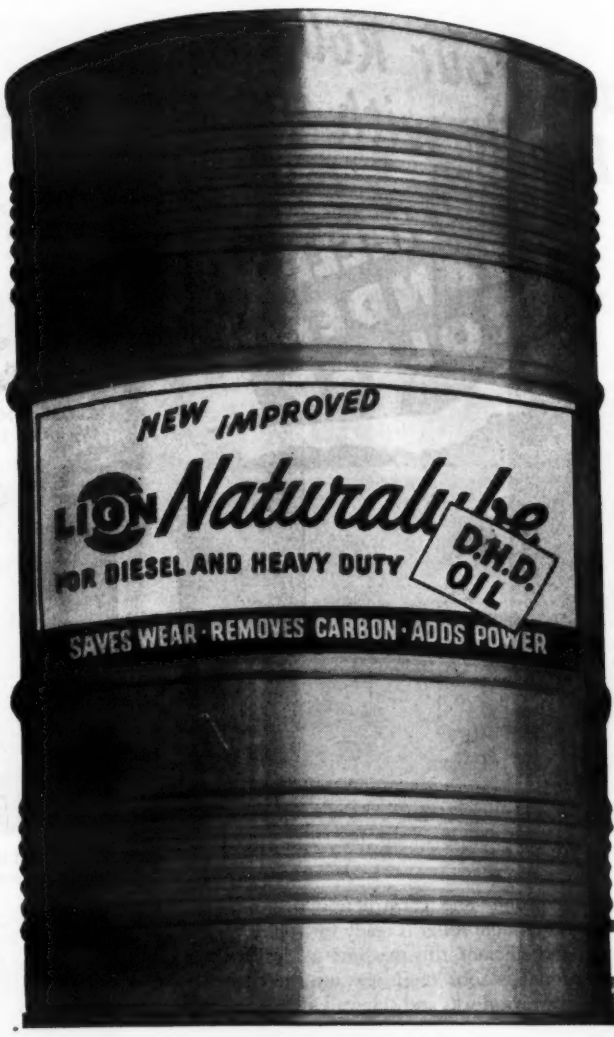

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C. & E. M. Photo

A Lorain 1½-yard shovel loads a Mack truck with 12 yards of tunnel muck to be dumped in Queens. The Andrew Gull Corp. has the contract to remove rock from the Brooklyn-Battery Tunnel.

Twin Tunnels Boring Under River in N. Y.

(Continued from preceding page)

tion of cast-iron ring is used through the rock portion of the tunnel than is used through the mixed face. Only 90 heavy rings are required for both tunnels as against 2,770 so-called light rings.

The segments in the light ring weigh 1,750 pounds each and the key 500 pounds, for a total weight per ring of 12½ tons. The heavier rings weigh 22 tons. In each ring 160 bolts are needed to tie the segments together; these measure 1⅜ x 5½ inches and weigh 5 pounds each in the light rings and 10 pounds in the heavy sections. The cast-iron segments are 32 inches wide. The light segments have a minimum skin thickness of 1⅛ inches; the heavy a minimum of 1⅝ inches.

In the past, tunnel ring bolts have usually been tightened by hand with 5-foot wrenches. In recent years a hydraulic bolt tightener was developed and five of them were used on the Lincoln Tunnel. But the Triborough Bridge and Tunnel Authority and Mason & Hanger have devised a pneumatic bolt tightener which is a more compact unit. Five of these machines can work on one ring at the same time. Operated by an I-R tube-expanding air-driven motor and manned by a crew of three, five of these tools can draw up a complete set of 160 ring bolts in from 20 to 30 minutes; this is about one-fourth the time formerly required by the same number of men doing the work by hand. The bolt tightener works on from 40 to 45 pounds of air pressure.

The ring segments are carefully constructed with tapered joints when curves or grades are being lined. The cast-iron surfaces are machined for joining other segments to assure a watertight fit, and they are washed thoroughly before being bolted in place. Both cross and radial joints are later caulked with lead stripping which is then covered with a 1:1 grout cover. This sand-cement grout not only fills any little voids but also serves as a detector of any moisture that may seep through the joints. If wet spots appear, more caulking lead is hammered into the joint spacing and regrouted.

The next step is to remove the 2-inch plug at the center of each segment and blow gravel through a hose and nipple so that the voids between the ring and the excavation line are filled; thus the tunnel is embedded firmly into the surrounding material. Grout in 1:1 proportions is then forced through the same holes, making a layer of concrete outside the tunnel. In soft material this gives the tunnel a foundation and prevents settlement. The final step in this tunnel construction contract will be the placing of the concrete lining over the inside facing of the cast-iron rings.

Quantities and Personnel

The major items on the Mason & Hanger Co., Inc., contract include:

Excavation, earth and mixed face (compressed air)	11,000 cu. yds.
Excavation, rock (free air)	230,000 cu. yds.
Cast-iron lining rings	36,645 tons
Concrete lining	47,200 cu. yds.

The contract price for the construction of these twin tubes, each 4,000 feet long, from the construction shaft in Battery Park to a point about 100 feet south of Governors Island in the East River where the other contract picks up, will come to about $16,000,000. This figure has varied from the original bid due to suspension of the contract because of the war and the subsequent rise in costs.

Miles I. Killmer is General Manager of the Mason & Hanger Co. and Howard L. King is Chief Engineer. Job personnel includes Allan B. Lincoln, Job Manager; John A. Ury, General Superintendent; Guy W. Sackett, Jr., Resident Engineer; E. S. Jermyn, Master Mechanic; Frank Slipp, Electrical Superintendent.

The Triborough Bridge and Tunnel Authority has J. J. Nanry, Resident Engineer, as representative on this portion of the tunnel.

Members of the Triborough Bridge and Tunnel Authority are Robert Moses, Chairman; George V. McLaughlin and Charles G. Meyer, Vice Chairmen. George E. Spargo is General Manager and Ralph Smillie, Chief Engineer. W. McK. Griffin is Deputy Chief Engineer, J. Mechanic is Engineer of Construction, and J. H. Quimby is Engineer of Design.

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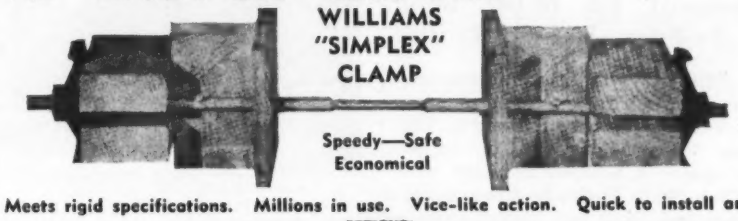

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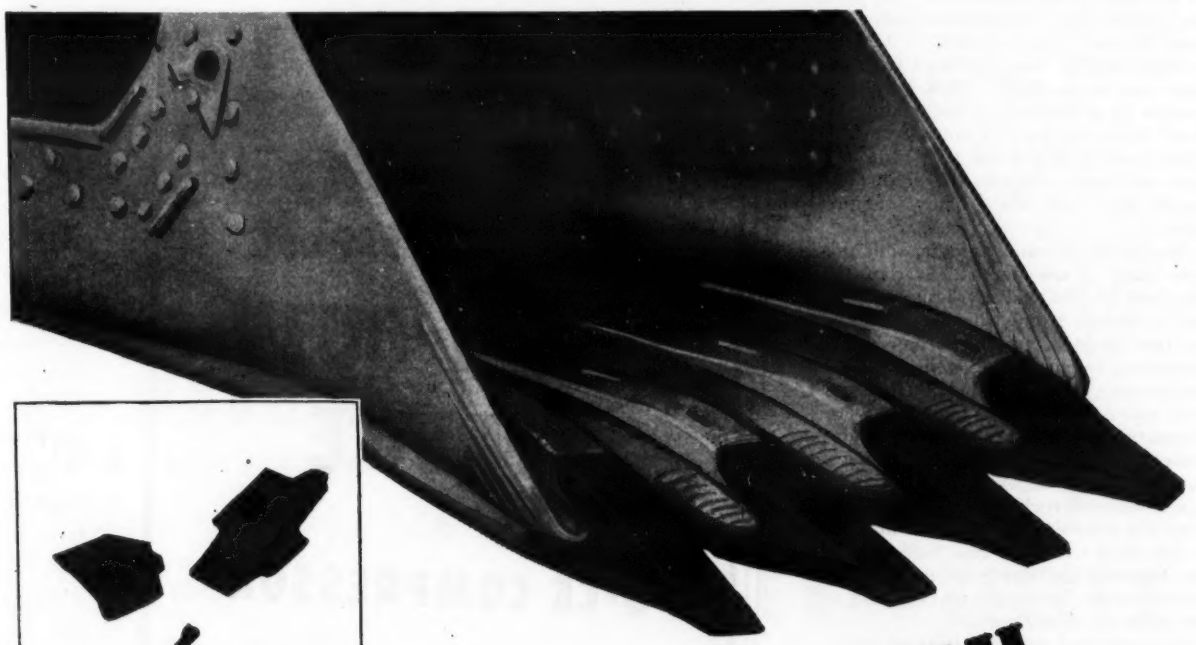

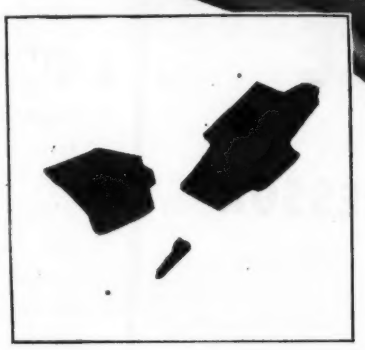

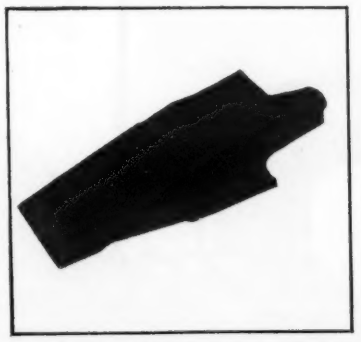

Top: Perfect fit of tooth onto adapter takes all shock and strain. Only function of Alloy steel pin, which is held in place by molded live rubber sheathed in steel at point of contact, is to lock the point on the adapter.

Above: Renewable tooth attached to adapter.

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✦ A NEW 8.574-mile bituminous cut-off between Salt Lake City and Magna, Utah, has recently been finished by Olof Nelson Construction Co. of Logan, Utah, under a $239,000 contract with the Utah State Highway Commission. The new road, with two 13-foot asphaltic-concrete lanes, carries a portion of U. S. 40 traffic, and was built under the Federal-Aid program.

During the war years, extremely heavy traffic between the Magna milling district and the state capital created a bottleneck which made the construction of this new route imperative. And since the traffic did not decrease after the war, the job remained high on the state priority list for construction. The contract was let on April 1, 1946, with September 25 scheduled for the completion date. By using the new route from 21st Street out of Salt Lake City, automobiles no longer have to travel through South Salt Lake City before turning west.

One of the unusual things about this new road is the departure from the standard 24-foot width. The new route has a 26-foot riding surface, designed for two lanes of traffic. It has 7-foot shoulders, fairing off to gentle 4 to 1 backslopes. The rounded ditches on both sides of the new highway were placed well below the level of the subgrade, so that drainage would be adequate. A 12-inch layer of 2-inch and 1-inch crushed rock under the slab extends out over the shoulders, to make a 40-foot total width for two traffic lanes. The finished highway presents an extremely wide, safe appearance, and a very smooth-riding surface.

The new road was laid through level country in a new location at the base of the Wasatch Mountains. The embankment was prepared by Caterpillar D8's and LeTourneau Carryalls, and rolled by tandem sheepsfoot rollers to 95 per cent of optimum density. Compaction tests were run every 500 feet on each 6-inch lift. In cut sections the natural ground was scarified to a depth of 6 inches and sheepsfoot-rolled until it met the required density.

C. & E. M. Photo

Selected sub-base rock for the 8-mile cut-off between Salt Lake City and Magna, Utah, was produced by this veteran Cedarapids stationary rock crusher which was set up 4 miles from the job center.

Crushed-Rock Blanket Course

The Utah State Highway Commission is a great believer in the use of crushed-rock blankets under its pavements. Specifications on the Nelson job called for the contractor to crush a 6-inch course of minus-2-inch stone, a 6-inch topping course of minus-1-inch, and to provide sealing chips. A veteran Cedarapids plant was brought in and set up in a designated pit 4 miles from the center of the job. This plant, rated at 100 tons per hour, was powered by a Caterpillar D13000 diesel engine.

Native material was supplied to this plant by a Caterpillar bulldozer mounted on a Caterpillar D8. It was pushed up to a 12 x 12-foot receiving hopper by the bulldozer, and carried from there into the plant by a 24-inch rubber belt conveyor. After passing through the Cedarapids plant, the crushed aggregate was delivered to a 20-ton Blaw-Knox surge bin, tapped by sliding bottom gates. A fleet of 12 GMC dump trucks took crushed material from this bin and hauled it from 4 to 8 miles out to the job.

(Continued on next page)

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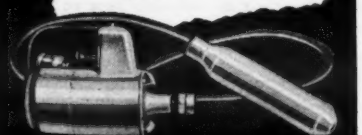

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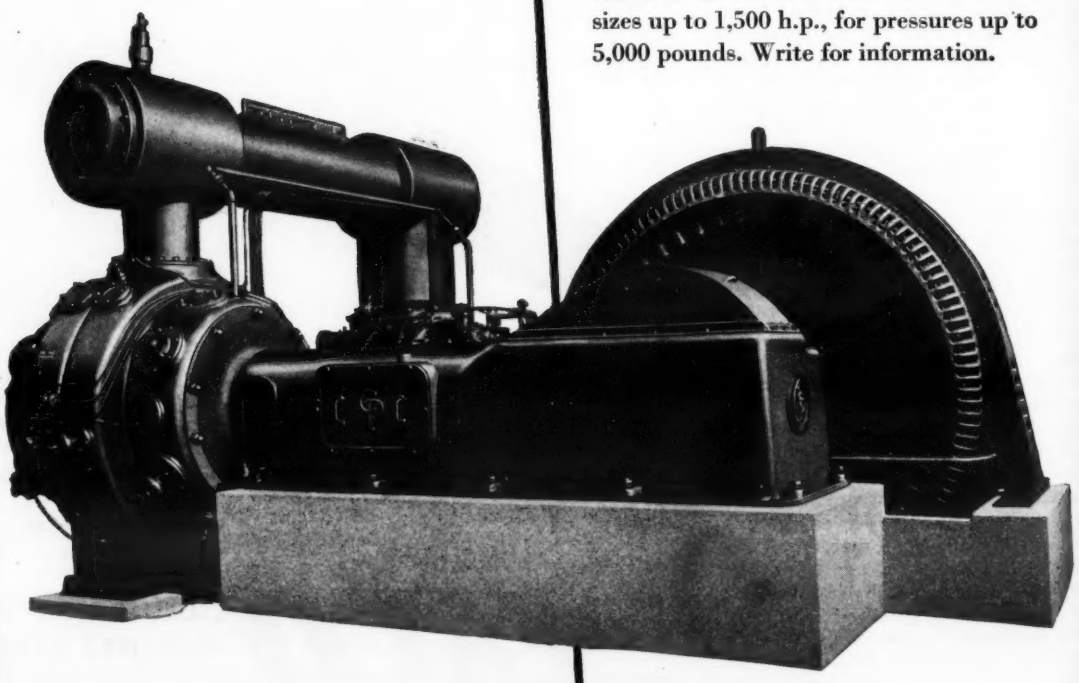
The CP Class O-CE Compressor is of the horizontal, double-acting, water-cooled type, with direct-mounted synchronous motor drive. It is furnished in sizes up to 1,500 h.p., for pressures up to 5,000 pounds. Write for information.



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C. & E. M. Photo
Crushed-rock shoulders, 7 feet wide, extend the two-lane Utah cut-off to a 40-foot width. Here they are being dressed by a Caterpillar motor grader before being compacted.

New Wide By-Pass

(Continued from preceding page)

The minus-2-inch rock was first laid in a full-width course 6 inches thick. Water was applied by sprinkler trucks, and rolling was done by sheepsfoot rollers. After the first course was laid, a 6-inch course of minus-1-inch rock was placed by the same methods and rolled down. Careful dressing of the top surface of this rock was done by a Caterpillar No. 12 motor grader.

After the top had been worked down smooth and dense, a final rolling by a Buffalo-Springfield 10-ton tandem roller readied the base course for surfacing. This rock blanket was laid only under the traffic lanes at that time; the shoulders were left for later work. This was done to speed up, as much as possible, the preparation of subgrade while the weather was hot.

The crushed-rock base was primed with Wasatch MC-1 asphalt, applied at the rate of 0.5 gallon per square yard through an Etnyre pressure distributor. Asphalt was heated to a temperature of 240 degrees before priming. It reached the rock at an average temperature of 225 degrees. Since some traffic had to be routed through the job, this prime coat was applied 13 feet wide on only one traffic lane, and in 4-mile strips. Traffic was kept off the prime coat until it had penetrated about ⅝ inch and dried. In any case, it was allowed to cure at least 48 hours before the hot-mix was spread.

Hot-Mix Asphalt Paving

The Nelson Co. brought in its Madsen asphalt plant, which has seen seven years of service in defense and war work, and set it up on a mesa in the center of the job. Crushed rock was hauled from the Cedarapids plant by the company-owned GMC truck fleet, and dumped to a receiving hopper. Between 700 and 800 tons per 8-hour shift were mixed by the Madsen plant, in 2,500-pound batches. Six of these batches were hauled on each truck load which went out to the job.

The bituminous surfacing was mixed at the Madsen plant by putting in 3½ to 4 per cent by weight of 200 to 300-penetration Wasatch asphalt, and 1 per cent of gilsonite. The addition of gilsonite, which is a native Utah mineral, made the mix extremely black and rich in appearance. When the first batches were sent out to the job, contractor's men and inspectors thought it was dangerously over-asphalted. Samples were taken and sent in to the state laboratory, where the mix was pronounced perfect.

Placing bituminous mix on a 13-foot course, without hand raking, made it necessary to change the Barber-Greene Tamping-Leveling Finisher. A 12-inch extension was built on the side of this machine, and a similar extension was put on the screeds and tamping bar. Since the Barber-Greene machine puts about 60 per cent of the ultimate compaction in bituminous surfacing when it lays this course down, it was highly desirable that this be done to obviate the necessity for hand raking.

The hot-mix trucks arrived on the job so rapidly that it was not necessary to cover the loads. A dump man directed the trucks backing to the receiving hopper of the Barber-Greene Finisher, and pulled the tail-gate. The dump trucks were pushed along by a roller on either side of the Barber-Greene machine. The finisher worked with a plumb line to the center line of the highway established by State Highway Commission surveyors.

The hot-mix crew consisted only of a Barber-Greene operator, a screed adjuster, and two helpers. One of the helpers dumped the trucks. The job Paving Superintendent, Aaron Smith, supervised the paving operation.

In order to obtain the required 2½-inch compacted thickness of pavement, the mix was laid down 2¾ inches by the Barber-Greene machine. This thick-

(Concluded on next page)

Dallett's Contractor Tools

ASPHALT CUTTERS
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DALLETT'S Line of Contractor Tools are made under rigid standards and from the material best suited for their intended applications. Dallett's quality tools will always give top performance.

Write for Bulletin C-220

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THE MODEL "M" Dorsey
MACHINERY TRAILER
with Built-In DURABILITY
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ECONOMY

The rugged Dorsey Model "M" Machinery Trailer does big jobs in a big way! No breakdowns! — no delays!— skilled Dorsey engineering specifies only high-quality materials and master craftsmanship . . . resulting in 3 outstanding features that make Model "M" operation —

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Durable!— the Model "M" takes any hauling job in smooth, easy stride . . . from 15 to 25 tons!

Economical! — the Model "M" combines *Durability* and *Dependability* to give fast, low-maintenance heavy machinery transportation — any and *every* time you want it!

Ruggedly built for steady service . . . promising a long, uninterrupted work-life . . . The Dorsey Model "M" Machinery Trailer boasts —

Positive Action Brakes to assure Passenger Car control — and safety!

Patented Tubular Trunnion-type Axles to absorb road shocks and ease wear and tear on the trailer!

A Frame Sturdily Constructed to give you year after year of *trouble-free* service!

Write TODAY for Dorsey Bulletin 8210!

15 TON
20 TON • 25 TON

In the Model "M" group of 15-ton, 20-ton and 25-ton capacities, there is a Dorsey hauling unit well adapted to your requirements. So, to lighten your heavy hauling problem, check *today* with your nearest Dorsey dealer or distributor. *Save* — by studying the *Modern Designed Transportation* advantages *built into* the Dorsey Model "M" Machinery Trailers!

DORSEY
DORSEY TRAILERS
ELBA, ALABAMA, U.S.A.

New Wide By-Pass

(*Continued from preceding page*)

ness was uniform throughout the job, and the weather did not change enough while pavement was being laid to cause any major difficulties. As soon as the initial blue smoke ceased to rise from the pavement, a Buffalo-Springfield 10-ton tandem roller made a longitudinal pass over all the surface.

After an approximate 20-minute wait, rolling then was carried on continuously for 4 hours to iron the pavement surface to its final form, and to obtain the proper density. Construction joints at the end of a day's run were formed square, and the next day's mix was raked up against this joint.

The center joint, caused by placing the pavement in two lanes, was largely eliminated by leaving it square on the first course, and then rolling the joint first when the other course was laid. Continuous and heavy rolling of the center joint while the asphalt was hot eliminated any possibility that this joint might later begin to ravel out or fail in any other way.

The paving progressed at the rate of 4,000 feet in an 8-hour run, despite the fact that many of the contractor's machines were old and well worn. This does not mean to imply that they were inefficient; rather, it was remarkable how well they performed. A repair yard and a shop equipped with small tools was set up near the eastern end of the job to keep tractors, trucks, and earth-moving equipment running. One of the handiest rigs on the job was a trailer-mounted Hobart electric welder. This machine hurried to the rock crusher several times a week to weld some broken part back in place; it was used around the yard to repair Carryall blades and equipment; and it had a part in widening the Barber-Greene Finisher.

Shoulder Construction

When the paving was finished, the GMC trucks hauled and dumped crushed rock for the shoulders. This material was spread by a Caterpillar No. 12 motor grader, and watered and compacted in the same manner as the pervious blanket previously mentioned. The finished shoulders are sufficiently strong to permit any present-day vehicle to pull off the highway in any kind of weather and change a tire. In an emergency, a vehicle moving at 60 miles per hour may take to these wide shoulders without danger of upsetting.

Personnel

On-the-job personnel included Aaron Smith, General Paving Superintendent throughout the project. Jack Parson was General Superintendent for the Olof Nelson Co. at the start of the job, and F. F. McKinnon directed the job in its final stages. Roy W. McLeese is the Chief Engineer of the Utah State Highway Commission in charge of the general supervision by the State.

Hose-Coupling Bulletin

Its line of hose coupling is carefully described in a bulletin recently made available by the Kelly Machinery Co., 2524 W. Madison St., Chicago 12, Ill. Bound in a manila folder, it will fit into any standard-size file drawer.

Some of the features claimed by the company for its products are dependability, interchangeability of all locking heads, quick action, and airtightness. All Trojon or Duro locking heads from ¼ to 1-inch sizes are interchangeable. The couplings are connected or disconnected with less than a quarter turn, the manufacturer says. Gaskets have flanged portions set in deep-ground finished recesses to give airtight fit.

The catalog contains complete information on all features, types, and models of Kelly iron and bronze hose couplings, clamps, menders, and nipples. Catalog No. 110 also contains a pocket-size circular listing the outstanding features and sizes of connections available.

Copies of this literature may be obtained from the company. Or use the enclosed Red Request Card. Circle No. 72.

C. & E. M. Photo

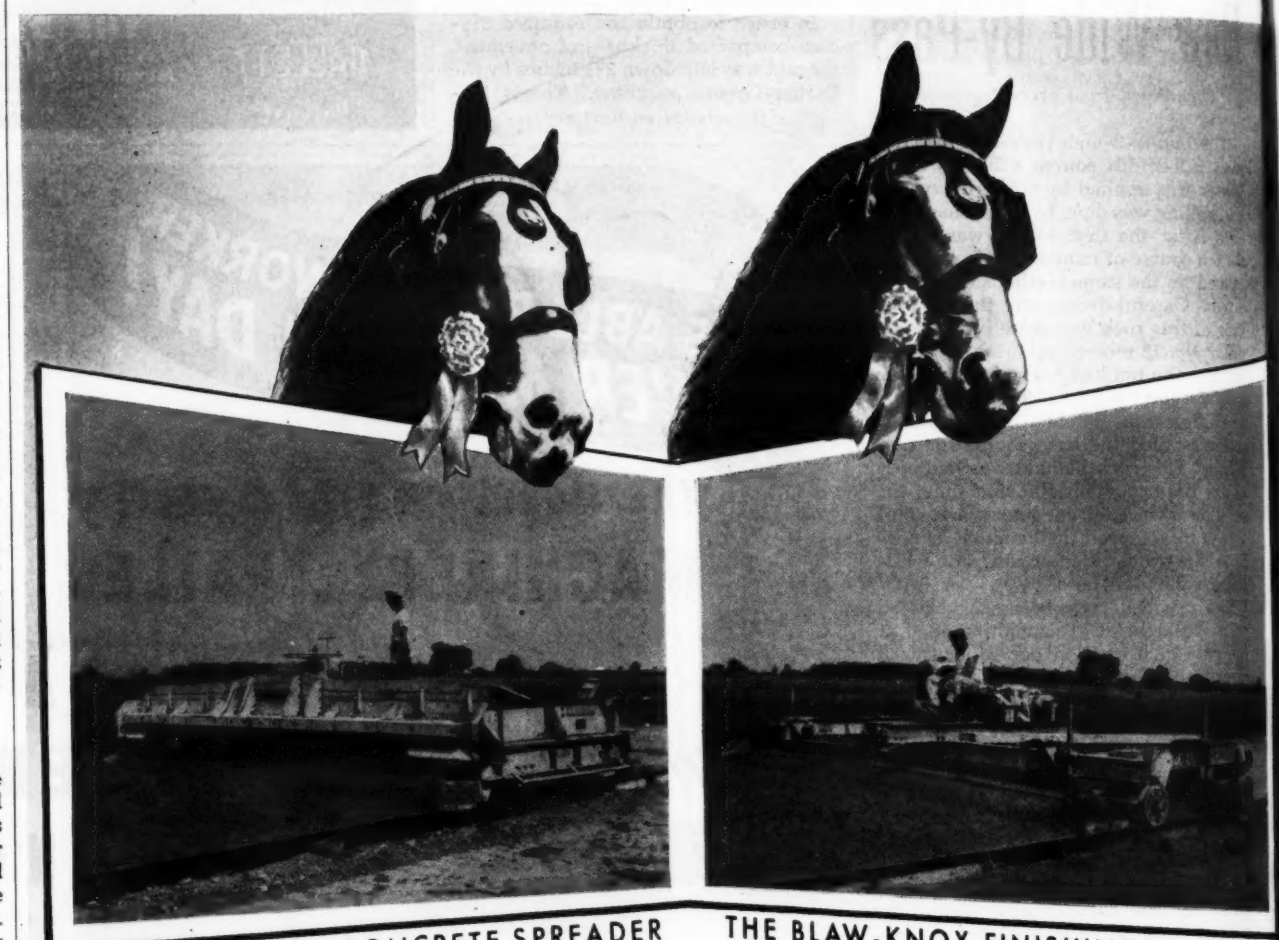
Olof Nelson Construction Co. set up a repair yard and office near the base of the Wasatch Mountains at the eastern end of the job, to service its well worn equipment.

Tank-Car Heater Data

The line of tank-car heaters and boosters made by the Cleaver-Brooks Co., 5100 No. 33rd St., Milwaukee 9, Wis., is described in Catalog R. M. 102 which is issued by the company. These units are designed for fast direct or steam heating of bituminous material in tank cars.

The catalog includes photographs of the equipment in use; blueprints and line drawings of the construction features; and sketches showing flow through the heaters. Text describes the various features claimed for the units, and lists their capacities and uses.

Copies of this literature may be obtained from the company. Or use the enclosed Red Request Card. Circle No. 78.



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THE BLAW-KNOX FINISHING MACHINE

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You'll get big yardage — with minimum crews. All Blaw-Knox Construction Equipment is designed to give just that kind of job performance.

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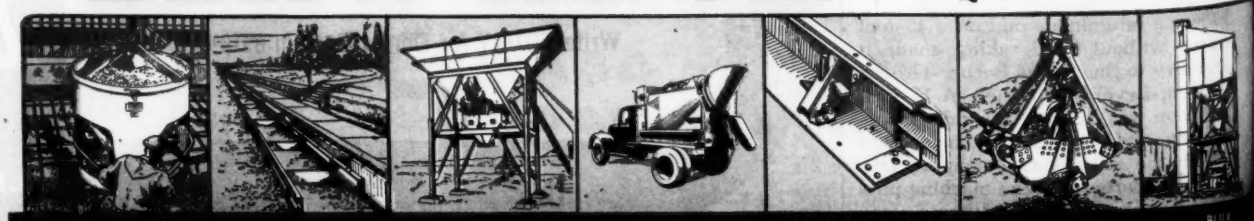
BLAW-KNOX CONSTRUCTION EQUIPMENT



CONCRETE BUCKETS | STEEL STREET FORMS | AGGREGATE BATCHING PLANTS | TRUCK MIXERS | PAVING FORMS FOR ROADS & AIRPORTS | CLAMSHELL BUCKETS | BULK CEMENT

Joint, Curing-Compound State Spex Are Surveyed

The results of its 1947 survey of concrete-highway paving specifications have been made available in folder form by Keystone Asphalt Products Co., 43 E. Ohio St., Chicago 11, Ill. Subjects studied include transverse expansion joints, dummy contraction joints, center strips, joint-sealing compounds, concrete-curing compounds, and some miscellaneous information.

The subjects covered are broken down by states, and the specifications for each individual state are listed after it in tabulated form. Also included is a general résumé prepared by Keystone engineers which gives their analysis of the survey findings.

Copies of this literature may be obtained from the company. Or use the enclosed Red Request Card. Circle No. 65.

Low-Temperature Welding

The features of arc welding at temperatures well below the fusion point of the base metal are described in a new 4-page pamphlet. It is issued by the Eutectic Welding Alloys Corp., 40 Worth St., New York 13, N. Y., to announce its new metal arc electrodes.

The booklet describes the development, advantages, applications, and other data on these flux-coated rods for arc welding all types of metals. It is claimed that the flux coating on these rods permits welding at lower base-metal temperatures than are ordinarily required.

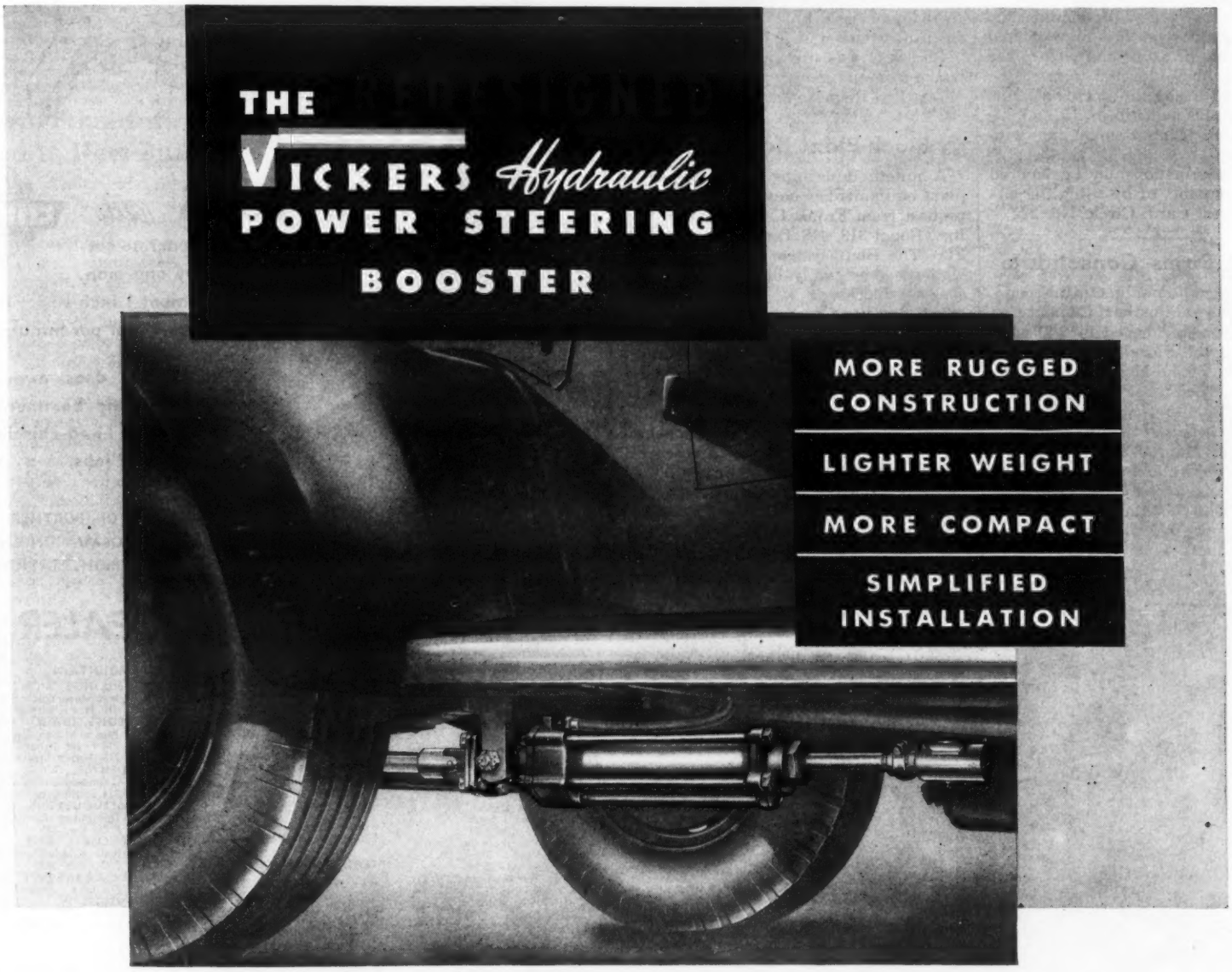
The booklet shows typical applications of the LowTemp EutecTrodes for a variety of welding jobs from delicate low-heat work to heavy castings. It shows which models are available, in what sizes, and on what types of metals to use them. It is stated by the maker that they can be used for welding cast iron, brass, bronze, and aluminum.

Copies of this literature may be obtained from the company. Or use the enclosed Red Request Card. Circle No. 73.

Lima West-Coast Managers

The Shovel & Crane Division of Lima Locomotive Works, Inc., Lima, Ohio, has announced the appointment of M. E. Army and Ralph Rodgers as Assistant District Managers of the Pacific coast district.

Mr. Army makes his headquarters with Smith Booth Usher Co., 2001 Santa Fe Ave., Los Angeles. Mr. Rodgers will have his office with Paul Fenwick, District Manager for Lima at 1315 Howard St., San Francisco.



Added to the advantages always inherent in Vickers Hydraulic Power Steering are now lower price, a substantial saving in weight, more rugged and compact construction and an integral (instead of a separate) relief valve that greatly simplifies installation. More than a year's testing on city buses and heavy trucks under the most severe operating conditions has proved the redesigned Vickers Hydraulic Power Steering Booster (original design has been in use for 16 years).

The steering effort required can easily be supplied by your little finger . . . steering load is carried by the hydraulic cylinder . . . road shocks are not transmitted to the steering wheel . . . automatic protection against abuse . . . see new Bulletin 47-30 for all the facts about Vickers Hydraulic Power Steering System.

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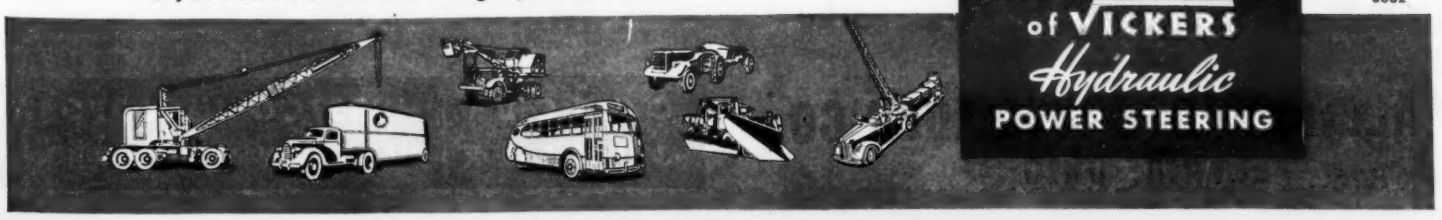
ENGINEERS AND BUILDERS OF OIL HYDRAULIC EQUIPMENT SINCE 1921

Write for NEW BULLETIN 47-30

Illustrating and describing the Redesigned Vickers Hydraulic Power Steering System.



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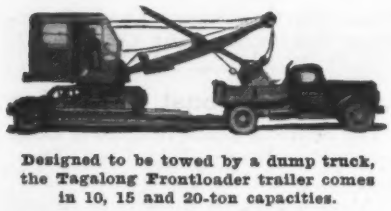


Designed to be towed by a dump truck, the Tagalong Frontloader trailer comes in 10, 15 and 20-ton capacities.

New Equipment Trailer Towed by Dump Truck

A trailer designed to haul small and medium-size construction equipment and to be towed by a dump truck has been announced by Rogers Bros. Corp., 100 Orchard St., Albion, Pa. It is known as the Tagalong Frontloader.

To attach the trailer for hauling, the body of the dump truck is first lowered to relax cable pressure and engage the sheave. It is then elevated to raise the drawbar and insert the towing tongue. The Tagalong is made in 10, 15, and 20-ton capacities; it has a single axle with four wheels.

Further information may be secured from the company, or by using the enclosed Request Card. Circle No. 22.

Cement Firms Consolidate

A new cement manufacturing company, the General Portland Cement Co., has recently been formed by the consolidation of the Florida Portland Cement Co., the Signal Mountain Portland Cement Co., and the Trinity Portland Cement Co. Smith W. Storey is President. Headquarters of the new company are at 111 W. Monroe St., Chicago, Ill.

General owns and operates five cement-manufacturing plants located at Tampa, Fla.; Chattanooga, Tenn.; Houston, Fort Worth, and Dallas, Texas. Production includes gray portland, white, high-early strength, masonry, and oil-well cements.

Safety Flasher Light For Highway Equipment

A safety flasher light for highway equipment is made by the Auto Gear & Parts Co., Inc., 1610 W. Hunting Park Ave., Philadelphia 40, Pa. This Keystone light is designed for mounting on snowplows, on equipment employed for emergency night work on roads or bridges, or on any machines required to travel at slow speeds or park on the highways.

Catalogs describing the light and its construction are now being distributed by the manufacturer. According to them, the light flashes 80 times per minute, both to the front and rear. The lens is 6½ inches in diameter, available in red, amber, or blue. And the light is furnished for 6 and 12-volt systems.

Copies of this literature may be obtained from the company. Or use the enclosed Red Request Card. Circle No. 68.

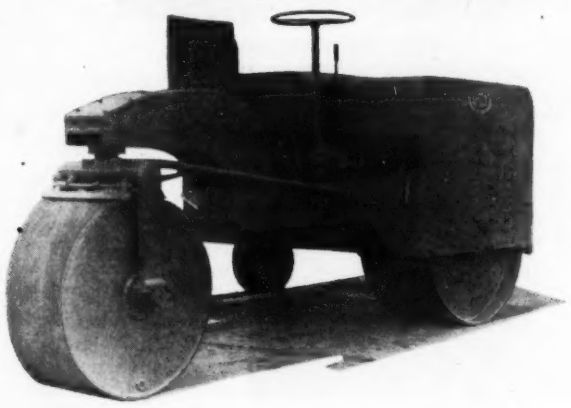
Block-Plant Equipment

A bulletin describing the Blatt block-plant equipment is now available upon request from Frank I. Blatt Sales Co., Inc., Room 319, 416 Tampa St., Tampa, Fla. The Blatt system is designed for high-speed assembly-line production of concrete blocks.

The literature describes the No. 1220 conveyor, the No. 12 mixer, the No. 3 hopper, the No. 14 water-control unit, and the Blatt universal block machine.

The latter is said to make several combinations and sizes of blocks: half blocks with one core; partition blocks with two cores; one, two, or three-core blocks; etc. They can be made in a variety of heights, and the three-core blocks can be made with square or open ends.

Copies of this literature may be obtained from the company. Or use the enclosed Red Request Card. Circle No. 82.



APSCO Presents a New Trench Roller

One of the highlight features of this new trench roller is the leveling wheel which is pneumatic tired, with adjustment by powered screw-type leveling unit.

Automotive-type steering gives unmatched maneuverability, allowing 45° turning radius. Two engine types are available, either Hercules or the Willys Jeep, with two speeds forward and reverse. Every journal is carried on Timken or Bower tapered bearings and is sealed in oil.

Roller is equipped with twin airflex or twin disc-type forward and reverse clutches. Front roll is 15" wide and rear roll has width of 18".

Write today for complete specifications of this modern trench roller.

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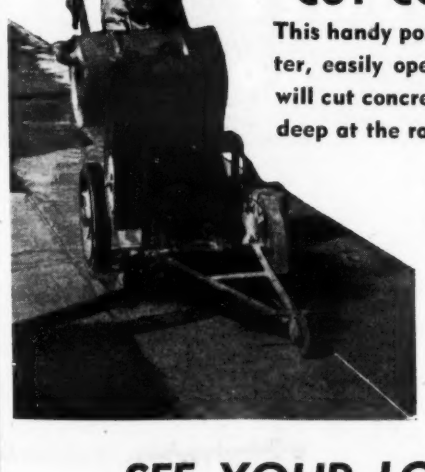

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This handy portable concrete cutter, easily operated by one man, will cut concrete pavement 1 inch deep at the rate of 3 to 4 feet per minute.

CONCUT JR. does away with costly pneumatic hammering or tedious hand-chiseling on smaller jobs.

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Officials of the Austin Co., the contractor, and the Buda Co., inspect the Buda earth drill at work on pier holes for the foundation of the Riverdale research and development laboratory of the Sinclair Refining Co.

Pier-Hole Foundation Used in New Building

The drilling of pier holes for the new Sinclair Refining Co.'s research and development laboratory in Riverdale, near Chicago, has recently been completed. The design and engineering of the building was planned on the use of pier holes, with concrete beams or mud sills carried by the piers, instead of the conventional method of continuous trenching to the full depth of the foundation and footing. This type of construction was chosen because it was felt it was especially economical in time and cost.

The building walls were set on concrete piers, tied in with concrete slabs to carry the wall. Single holes were drilled and immediately poured with concrete without the use of forms. At main bearing points, a group of five holes was drilled; these were filled with concrete and capped with a concrete slab as one unit.

The crews used a Model HBE Buda earth drill, chain and tube model, for drilling the 480 pier holes. Each of the 42-inch-diameter holes was dug 11 to 13 feet deep, in 30 minutes or less, according to the contractor, the Austin Co.

The crew operating the Buda earth drill consisted of the truck driver, who also acted as relief drill operator, and the regular drill operator. A crew of 12 men followed with concrete mixer and carts, requiring approximately 20 minutes to fill each hole with concrete and about 5 minutes to put in the reinforcing rod dowels at the top of the concrete footings.

Macadam Group Names New Engineer-Director

The appointment of Fred E. Swineford as Engineer-Director has been announced by Macadam Pavements, Inc., 1018-19 Huntington Bank Bldg., Columbus, Ohio. Other officers are Harry H. Brandon, President, and Frank Longabaugh, Secretary-Treasurer.

Macadam Pavements, Inc., is an engineering research and technical group organized in 1945 to devise and improve methods for building macadam pavements. The work of the corporation is handled by several technical committees which have been established to study special problems in this type of highway construction.

Orange Peel Buckets

An 8-page bulletin describing its larger sizes of orange peel buckets is now being distributed by The Hayward Co., 50 Church St., New York 7, N. Y. These buckets are designed for use in handling all classes of material from oozy mud to hardpan clay, blasted rocks, and boulders.

Specifications and recommended uses for the four major types of large-size buckets are contained in bulletin No. 803. Also described are the back plates available to give added strength to the blades of the heavy standard and the heavy multi-power models.

The final page of the bulletin mentions some of the other Hayward models: the dwarf orange peel bucket which is made in a size small enough to fit inside a 12-inch opening; and the four types of Hayward clamshell buckets.

Copies of this literature may be obtained from the company. Or use the enclosed Red Request Card. Circle No. 81.

Concrete Surfacers Are Described in Bulletins

A highway surfacer for grinding down uneven expansion joints and surface irregularities from concrete and asphalt highways is described in a bulletin released by The Concrete Surfacing Machinery Co., 4667-4669 Spring Grove Ave., Cincinnati, Ohio. Powered by an air-cooled Wisconsin engine, the unit features a power take-off for use with other concrete tools.

The bulletin lists the features of the Berg surfacer, shows pictures of the equipment in use, and gives details of the various cutter plates available. It also illustrates the use of the power take-off with various Berg tool heads.

Another bulletin describes the Berg Models A, AD, and A-G2 concrete surfacers and finishers for removing fins, board or form marks, and other surface irregularities from concrete construction. Similar to these, but discussed in a separate folder, is the Model W water-feed concrete surfacer for use in either wet or dry rubbing. The folders describe the use and construction of these units and show various applications.

The last catalog in this series is devoted to pictures and descriptions of Berg machines, tool heads, power units, and accessories.

Copies of this literature may be obtained from the company. Or use the enclosed Red Request Card. Circle No. 69.

Engines FROM 90 to 215 HP. Generators FROM 60 to 115 KW
More Power
MURPHY DIESEL
More Profit
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U. S. ROYAL *LOGGER*

For all operations where traction, long wear and rugged strength are required. Cut-resisting tread protects against injury from rocks, snags. Self-cleaning design maintains maximum traction, prevents rock retention.

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For service that subjects tires to abrasive "stop-and-start" wear. Extra-thick, massive tread and buttressed shoulders deliver *more* mileage, protect sidewalls against curb scuffing. Center running rib makes rolling easier, adds to tread life.

These rugged U. S. Royals have the *extra* strength of U. S. Safety Bonded Cord construction! *Each cord* is rubber-coated for heat and friction insulation . . . and "webbed" together into a tire fabric unequaled for wear!

In *all three* the tire body is attached to the steel wire beads by a specially designed bead anchoring that rigidly ties the beads to the carcass. And *all three* have two extra shock pads under the tread to guard against impacts and blowouts.

The *tread* design of each tire is the result of extensive engineering tests *in the field!* The result? *Peak performance!*

U.S. ROYAL TIRES

UNITED STATES RUBBER COMPANY

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L. J. Carter of Monroe, Wash., backs his International TD-14 tractor away to expose the business end of the Isaacson Klearing Blade which has torn out the roots of this stump. The Klearing Blade replaces the usual blade on the Isaacson Trac-Dozer.

Tree-Stump Removal Paul Bunyan Style

New tools are available for road men confronted with the problem of removing large tree stumps. These special blades are designed for use with diesel crawler tractors to simplify land-clearing jobs and reduce time and labor.

The accompanying photograph shows an Isaacson hydraulic Trac-Dozer with an Isaacson Klearing Blade used in place of the usual dirt blade, mounted on an International TD-14 tractor. The teeth of this blade are used to get a purchase on roots beneath the soil. The roots are then torn out by using the lifting power of the hydraulic system. The Isaacson WO-14 winch mounted at the rear of the tractor can be used to drag the bigger stumps to the burning piles and to pull them loose from the soil. The blade is also applicable to clearing land by using the teeth to comb the soil and remove root fragments and rocks.

Further information may be secured from the company, or by using the enclosed Request Card. Circle No. 17.

Machine Reproduces All Types of Material

A new machine for reproducing drawn, typed, printed, or photographed material has been announced by Ozalid Division of General Aniline & Film Corp., Johnson City, N.Y. The machine features positive prints by a dry-developing method.

It is stated that the new Ozalid Streamliner will reproduce any copy made on a translucent material. It will handle originals up to 42 inches wide, with no limit on length. The lines and images can be reproduced in black, blue, red, sepia, or yellow to distinguish prints of different departments. They can be made on paper, cloth, foil, film, or plastic. Ozaplastic can be used to produce oilproof or waterproof prints for shop and field use. And Ozachrome can be used to produce five-color transparent film overlays.

Printing speed is up to 10 feet per minute, and the machine may be run in reverse to remove a crooked sheet without damage or waste, the manufacturer says. Light is provided by a 2,000-watt high-pressure mercury-vapor glass lamp. Power for the machine is provided by a ⅓-hp electric motor. The printing cylinder is 6 inches in diameter.

Further information may be secured from the company, or by using the enclosed Request Card. Circle No. 23.

Concrete-Vibrating Tools

Concrete-vibrating equipment is described in two catalogs put out by the Master Vibrator Co., P. O. Box 657, Dayton 1, Ohio. This equipment consists of vibrators, vibratory finishing screeds, and accessories.

The catalogs are amply illustrated with photographs which show the equipment in use and point out the performance and construction features claimed for it. The equipment is designed for use with either gasoline or electric power, and the power units are listed in the catalogs. Also listed is a table showing the complete line and giving shipping weights and other pertinent details.

Copies of this literature may be obtained from the company. Or use the enclosed Red Request Card. Circle No. 80.

Diesel-Engine Magazine

Pictures and stories of nearly 100 varied installations of Cummins diesel engines are included in the first postwar edition of "The Dependable Diesel", a magazine put out by the Cummins Engine Co., Inc., Diesel Drive, Columbus, Ind.

The 36-page magazine tells of applications of the Cummins engines in the field, and gives a complete account of Cummins development of high-speed diesels. An article is devoted also to a story of the company's sales and service network.

Copies of this literature may be obtained from the company. Or use the enclosed Red Request Card. Circle No. 71.

Missouri AGC Officers

The election of E. W. Menefee as President for 1947 has been announced by the Associated General Contractors of Missouri. Mr. Menefee is President of W. J. Menefee Construction Co. of Sedalia, Mo.

Other officers elected are Alexander Maitland, President of Kansas City Bridge Co. of Kansas City, Mo., as Vice President; and James M. Joyce, Vice President of Cameron, Joyce & Co. of Keokuk, Iowa, re-elected Treasurer for the eighth consecutive year. E. C. L. Wagner of Jefferson City is Secretary and Manager of the Association.

Sales Manager for Davey

The appointment of Floyd Jones as Sales Manager of the portable-compressor division has been announced by the Davey Compressor Co., Kent, Ohio. He formerly was a district manager for the New York, New England, and southeastern Canadian territories.

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Pipe Line Laid 21 Miles In Mountain Country

Heavy Granite Blasting, Long Hauls Involved as Large-Diameter Concrete Pipe Is Laid for Aqueduct

✦ THE story of water shortages in California is as old as the history of that country. From the time of the Spaniards men have brought water from the mountain sources down to their desert habitat. The work is still in progress, this time to add to San Diego's water system. The city has outgrown itself in the past ten years and now a 71-mile aqueduct is being built from the west portal of the San Jacinto Tunnel of the famous Metropolitan Water District to San Vicente Reservoir near San Diego.

Starting near Temecula, Calif., and proceeding south, the United Concrete Pipe Corp. of Baldwin Park, Calif., is laying some 21.6 miles of reinforced-concrete pipe through extremely rough terrain, at a contract bid amount of approximately $3,585,000. Administration of the big project is under Rear Admiral J. J. Manning, Chief of the Navy Bureau of Yards and Docks.

The aqueduct project was started in wartime, under Presidential direction, to assure sufficient water for Federal installations through the San Diego water-supply system. Since so much of the engineering and planning had already been done by the Navy Department, the City of San Diego entered into a contract with the Navy for the continuation of the work after the war. This contract was later transferred to the San Diego County Water Authority.

The contract calls for yearly payments of $500,000 without interest over a period of 30 years, and the project will thus be self-liquidating. Capt. Alden K. Fogg, CEC, USN, Public Works Officer of the Eleventh Naval District, is the Officer-in-Charge of Construction. And the field inspection and direction is being administered through Commander R. D. Thorson, CEC, USN, Resident Officer-in-Charge.

Through boulder-studded granite mountains, roughest terrain in southern California, men and machines are cutting a path for the 48, 54, and 72-inch-diameter concrete pipe. In general, its diameter depends on the hydrostatic head: the higher the pressure the smaller the diameter. Fabricated in the United Concrete Pipe Corp. plant at Baldwin Park, the massive sections weigh up to 16 tons each. They are being hauled almost 100 miles and unloaded along the trench made accessible by an elaborate system of access roads built by the contractor.

Access Roads and Clearing

Though the aqueduct runs across some valley floors, much of its location falls on mountainous granite slopes, covered with 100-ton boulders and live-oak trees. The ditch line for the pipe had to be opened up fully, regardless of formation. But haul roads could be built with a little discretion through formations of decomposed granite or earth.

When work began, on May 30, 1946, it was planned to excavate all the heavy cuts (up to 30 feet deep) to within 15 feet of grade with bulldozers, rippers, and scrapers. One Caterpillar D8 tractor with a LeTourneau cable-controlled bulldozer blade was brought in initially. But this number was very shortly increased to five "Cats" as soon as Superintendent E. A. Smith saw what the machines were up against.

Granite boulders weighing 100 tons were frequently found above the ground surface where nature had exposed them by the ageless passage of time. And though they weighed 20 times as much as a D8 tractor, they needed only a slight start to send them crashing down the mountainside. Actually the removal of live-oak trees was more of a problem, for some of them were 24 inches in diameter at the base. It took brute butting and pushing by bulldozers to uproot them, and the big boulders were rolled out of the way by the same machines.

Wherever excavation was possible by tractor equipment, three Caterpillar D8's with LeTourneau 9-yard Carryalls were used. A LeTourneau K-30 Rooter was also brought in and used behind a Caterpillar D8 tractor. All excavated material was stockpiled beside the trench, because Navy specifications called generally for the ground to be left as it was before work commenced.

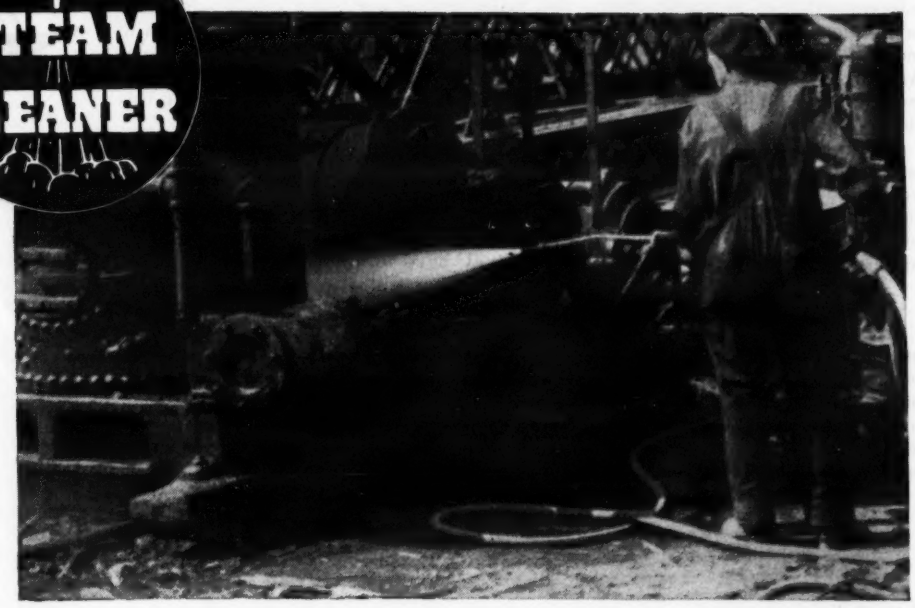
C. & E. M. Photo
A Lima 1201 dragline with a 3-yard bucket excavates trench for the San Diego aqueduct in hard rock, while a D8-mounted dozer (upper left) dresses the spoil pile.

It was hard, bruising work at its best for tractor equipment. The machines seldom saw material in which they

(*Continued on next page*)

HYPRESSURE Jenny STEAM CLEANER

Removes Oil... Dirt... Grease From Construction Equipment



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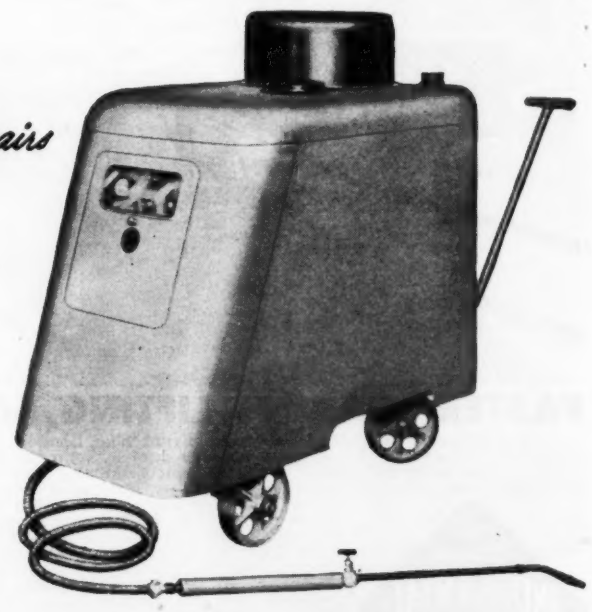

Thorough cleaning of all types of equipment can be done quickly, safely and inexpensively, in the shop or on the job, with Hypressure Jenny Steam Cleaner. One man using Hypressure Jenny can clean more equipment in 1 hour than 10 men can clean in the same time by hand methods.

Hypressure Jenny's blast of steam, hot water and cleaning compound, generated in less than a minute from a cold start, instantly loosens and flushes away mud, dirt and grease from tools and machinery, thereby increasing the efficiency of both men and machines ...exposes grease and oil cups so that proper lubrication may be supplied . . . reveals damaged or worn parts permitting repairs before costly service failures occur.

Used in the shop *before repairs,* Hypressure Jenny saves as much as 40% of your mechanic's time otherwise lost wiping off dirt and grease.

Why don't you put Hypressure Jenny Steam Cleaner to work for you? You will save time, labor, money. Write today for complete details and address of your nearest Hypressure Jenny dealer.

HYPRESSURE JENNY DIVISION

HOMESTEAD VALVE MANUFACTURING CO., P. O. Box 30, Coraopolis, Pa.

C. & E. M. Photo
Old-time dragline operators on the United Concrete Pipe Corp. aqueduct contract begin digging trenches at the slope line, working down on each side until they reach grade. Then they dig out the center chunk in short order.

Pipe Line Laid 21 Miles In Mountain Country

(Continued from preceding page)

could operate at more than 75 per cent of capacity. Since other equipment would have faced the limitation of distance in disposing of the material, the use of tractor equipment was certainly justified. In addition, the securing of steel was so difficult, in spite of the high Government priority rating on steel reinforcement for concrete pipe, that fabrication was delayed for several months longer than was anticipated. And this delay gave the tractor equipment time to knock down the first lift on heavy cuts.

Haul roads were roughed out by bulldozers and in some cases the Carryalls were used. A Caterpillar No. 12 diesel motor grader was brought in to dress access roads during their construction and after they were put to use.

Drilling and Blasting

From the time the job began, drilling and blasting has been a regular 9-hour feature each day, along with the other phases. So much of the job is being cut through granite that blasting has been necessary even in advance of tractor equipment, in some cases.

Two drilling crews were set up. A heavy-duty crew, with four Gardner-Denver wagon drills and two Gardner-Denver 500-cfm compressors for power, was put to work drilling holes as deep as 30 feet. The second drill crew was organized with twelve Gardner-Denver jackhammers, driven by two Gardner-Denver 365-cfm compressors. An Ingersoll-Rand 210-cfm portable machine was also brought in to help out wherever it was needed.

The wagon drills are accounting for 300 linear feet of hole per shift, despite fissures and disintegrated-granite seams. Stock drill steel in lengths up to 30 feet is being used with the drill bit forged on the drill steel. Bits give from 2 to 6 feet of drill travel, depending on whether the granite is decomposed or solid, before they dull. The steel is gathered up each day, sent to Baldwin Park on one of the big concrete-pipe trucks, and resharpened by two Ingersoll-Rand sharpeners in the United Concrete Pipe Corp. shop. Sharpened steel is sent out to the job each day the same way.

Drilling disintegrated-granite seams has been the trickiest part of all. When drill bits get down beyond these seams in hard material, the vibration causes large and loose particles to ravel off and fall down on top of the bit. Excess ground water promptly crowds them down around the steel. When drillers try to blow the material out of the hole, the pieces go back only to the nearest fissure, and drop right back on the drill as soon as it resumes work.

The only successful way to cure this condition is to insert a pipe casing to the bottom, and use a smaller-diameter air pipe inside this tube. This seems to force most of the objectionable particles out the top. Drill steel continues to get stuck occasionally, notwithstanding this little trick.

Each wagon driller has a chuck tender. Manhandling all the lengths of steel which go to make up a 30-foot hole is a backbreaking job. Men work at top speed when the drill is silent. They have to, for a 20-foot hole takes only 35 minutes to sink and a 30-foot hole takes less than an hour.

Drilling has been carried 12 inches below the grade line, and the trench section through rock has side slopes of ½ to 1 or less. So much ground water and so many subterranean springs have been found that very little granular powder can be used. The center row of holes in the 5-foot center grid pattern is sprung with 40 to 60 per cent Atlas gelatin, and all holes are then loaded with the same material. Past experience has proved that this granite requires 1¼ pounds to the cubic yard, if a 3-cubic-yard dragline is to dig with any speed. Each hole has one or more No. 6 Atlas blasting caps, and the shots are set off instantaneously by a hand-blasting box, and sometimes by means of a portable light plant.

The jackhammer crew operates on exactly the same principle as the wagon-drill crew, but of course its work is confined to shallower cuts. Both crews use about the same explosive ratio, and the action of the granite is

(Continued on next page)

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Altimeters
for all preliminary surveys
How much money will this instrument save YOU? Preliminary surveys in 1/10th the time with accuracy better than 1 part in 1000.
Type SA-1: Range 4360' (-760' to +3,600') in intervals of 2'
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Altimeters

C. & E. M. Photo

Superintendent E. A. Smith (left) and Pipe Foreman Nick Ban, of the United Concrete Pipe Corp., pause for a moment beside a section of aqueduct pipe. Note the string line, the precise fine grade, and the special field tool which pulls the pipe sections into place.

Pipe Line Laid 21 Miles In Mountain Country

(Continued from preceding page)

the same on a jackhammer bit as on the heavier steel. All drilling in rock is carried a foot below grade on the initial set-up to provide for a sand cushion on which the pipe can be laid.

Trench Excavation by Draglines

Two new Model 1201 Lima draglines were brought in, with 3-yard Esco rock buckets and 50-foot booms. One of these 124-ton rigs was purchased new especially for this job. The Lima rigs are used with a Northwest 1½-yard Pullshovel for deep trench digging.

The old-time operators on these two new draglines really know how to dig a trench. They do not dig the center first. They begin at the slope line. They gouge out several buckets on each side, swing the load over to the spoil heap, and dump it with a clatter of rock and a rattle of chains. Then they swing back and *slide* that heavy bucket ever so gently down the slope they've just cut. They gouge and work this slope down on each side until they reach grade. Then they dig out the center chunk in short order.

These grizzled veterans of power machinery watch newcomers try to dig the center cut first, and then have to fight the sides with the bucket. Most of the time they do not grin about it. They are not that kind. They look and act disgusted with such craftsmanship.

Operator Jess Howe was rambling through a farmer's field with one of the Limas the day the job was visited, and he was making 175 feet per 9-hour shift in an 11-foot-deep ditch. He was selecting topsoil from sand and dumping it separately, so the backfill would leave the field in as good shape as was possible. He dressed his side slopes as he went, and he handled the 3-yard can without a rattle, smooth as a new Cadillac. His machine was pouring out better than 1,200 cubic yards on his shift.

The other Lima, in heavy blasted rock, was also making a good showing. This machine worked up a very steep slope, fighting rock every inch of the way. Farther south the Pullshovel was roughing out another section of ditch. The entire method of excavating trench has been to work equipment as hard as possible, and, when it cannot keep up, to import other rigs. With pipe pouring in to the job, the matter of keeping the trench dug out far ahead has become vitally important.

The average output of the Lima 1201's has been 1,200 cubic yards per 9-hour shift, and the Northwest 1½-yard Pullshovel has produced 600 cubic yards in the same period.

Pipe Hauling and Unloading

The concrete-pipe sections, 16 feet long with a 5¾ to 7½-inch reinforced-concrete shell, are produced at the Baldwin Park plant of United Concrete Pipe Corp. The plant is set up to pour 40 sections in 8 hours.

Steel reinforcement consists of an inner and outer cage of rod steel if the pipe will not be subject to extreme pressure. For pipe which will be under pressures of over 100-foot head, the inner steel cage is replaced by a solid sheet-steel cylinder. The pipes are designed for pressures up to 550 feet of head. All pipes are cast with an embedded metal lock-ring bell-and-spigot joint. A slot in the spigot joint holds a rubber gasket, which compresses to form a watertight ring when the pipe sections are joined.

One-way hauls from Baldwin Park to the job vary from 90 to 125 miles. A fleet of 18 Autocar, Sterling, and Mack trucks with Fruehauf trailers are now busy from 9 to 15 hours each day.

(Continued on next page)

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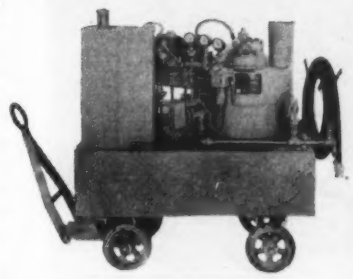
NEW Oakite-Vapor Unit puts the emphasis on speed . . . to save you cleaning dollars. Generates 100 lbs. of steam in 1 minute (rated capacity 200 p.s.i.) when and where you want it. Just flick the switch! Fuel capacity provides 8-hour, non-stop steam-detergent cleaning or paint-stripping cranes, crushers, diggers, excavators. Two-gun cleaning action. Vibrationless operation. No clogging of heater coils, because cleaning solution bypasses coils. Stationary, mobile models available NOW. Write.



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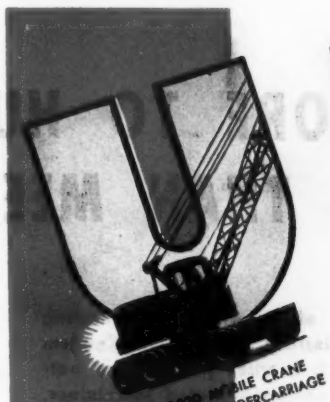

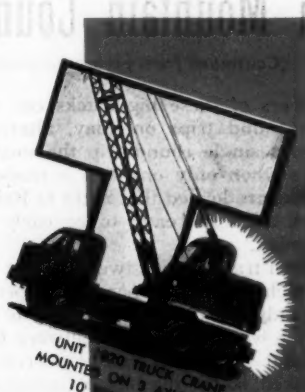

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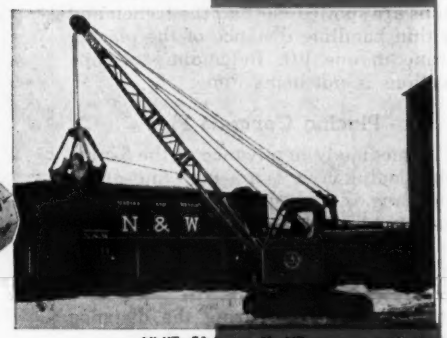

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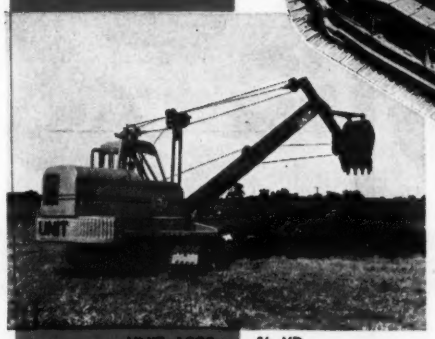

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Magnet . . . Pile Driver
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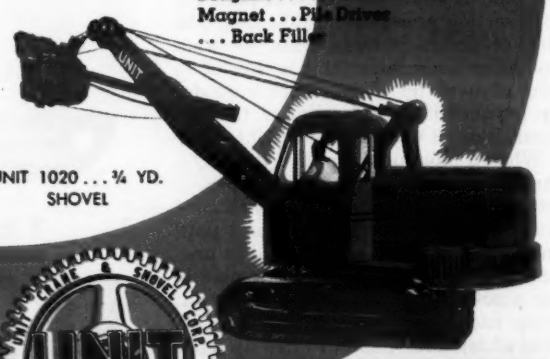
UNIT 514 . . . ½ YD.
DRAGLINE



UNIT 1020 . . . ¾ YD.
SHOVEL

UNIT CRANE & SHOVEL CORP.

MILWAUKEE 14, WISCONSIN, U.S.A.

Address: 6309 W. Burnham St., Milwaukee 14, Wis.

A 5005-1PCU-R2

C. & E. M. Photo
This Northwest crane, working with a high boom, unloads pipe sections from transport trucks which have hauled them about 100 miles. This picture indicates the rugged California terrain through which the contractor is cutting a 21-mile path for the aqueduct.

Pipe Line Laid 21 Miles In Mountain Country

(Continued from preceding page)

Drivers of these big trucks can make two round trips one day, alternating with a single round trip the next. On days when only one trip is made, the trucks are loaded that night at Baldwin Park and are ready to go early next morning.

Each trailer hauls two pieces of 48 or 54-inch-diameter concrete pipe per trip, but only one piece of 72-inch due to its 16-ton weight. The road between Corona and the job is rather narrow and crooked, so the big trucks cannot make time on that leg of their trip.

The access-road system has made it possible for the haul trucks to drive to the location where the pipe will be placed. The heavy sections are unloaded by a 20-ton Northwest crane, operating with a short boom radius. The pipe sections are spotted close to the trench and within handling distance of the placing crane in one lift. Rehandling of pipe sections is not being done.

Placing Concrete Pipe

Immediately in advance of the 5-man pipe-laying crew is a 3-man fine-grading gang. It fine-grades the trench to survey blue-tops set in every 50 feet on the straightaways, and every 16 feet on the curves. The fine grade is checked by stretching a chalk line between survey hubs and measuring the distance from the string to the ground. There is very little tolerance as to line or grade.

Pipe sections are lowered in place by a Lima crane. Each piece is well cradled in preformed cable slings. The spigot end is fitted with its rubber gasket, and brushed over with Sherwin-Williams compounded soap to help it slide into the bell.

When the spigot is lined up by the Lima operator, the pipe crew fastens a shop-made puller, with a cable bridle, to a Coffing chain hoist anchored inside the pipe. A strain on this hoist pulls the pipe section promptly into the bell. The rule-of-thumb determination of what makes an acceptable joint is this: if ½ inch of metal lip of the spigot end rides up beyond the flared collar of the bell connection, it will test watertight.

When a pipe joint is pulled that tight, there is only about an inch of opening left in the joint. This is filled with concrete grout in the field, but not until enough backfill has been placed to prevent the pipe from moving. One man in the pipe-laying crew does nothing but wrap each joint with an 8-inch-wide strip of asphaltic paper. Pulled up tight, this paper prevents earth from filling the opening.

A backfill crew places 6-inch layers of selected material from the trench excavation and compacts this fill up to the spring line of pipe, using six Gardner-Denver pneumatic pavement breakers fitted with backfill tampers. Then additional backfill is placed in the trench until the pipe is approximately 100 per cent covered.

A mixture of one part sand and one part cement is then prepared by a little Rex 2-sack mixer, with a Cushman engine for power. The men pour this fine grout in the top of the joint, and with long flexible steel wires they rod it all the way around the pipe. The specifications say that no further activity by heavy machines can take place for 4 hours after this outside grouting.

Backfill is then pushed in by bulldozer or clammed in by a Lorain 40 Moto-Crane, compacted by rolling equipment, and the ground left about the same as it was initially. After completion of backfilling, the joint is grouted on the inside with mortar.

Equipment Maintenance

Five miles below Temecula near the center of the job, United Concrete Pipe Corp. established a central operating yard. The job office and equipment-service facilities were set up at that point.

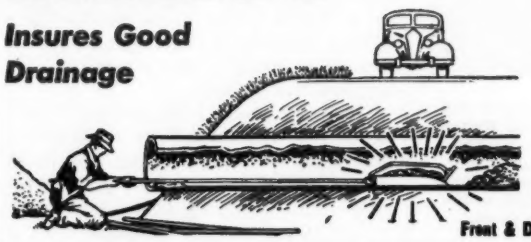
Designed for on-the-job operating repairs, the yard contains no elaborate repair facilities for major work. When a tractor breaks down, and extensive repair or an overhaul is necessary, that unit is loaded to a low-bed trailer and hauled in to the Baldwin Park shop. The job yard consists simply of a fueling station, three Armco Quonset storage sheds, and an open workshop for minor repairs.

This open-air shop has a Lincoln arc-welding machine, a Curtis air compressor, a Chicago Pneumatic drill stand and press, and a Millers Falls bench grinder. The usual assortment of heavy-duty small tools, a 4-battery charger,

(Concluded on next page)

MORCO CULVERT CLEANER

Insures Good Drainage

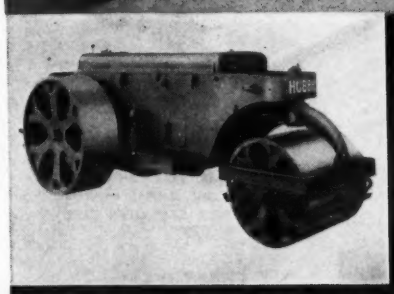


Restore clogged culvert pipes to service with the "Morco" Culvert Cleaner. Quick-acting, non-damaging, easy operating "Morco" is the most satisfactory tool yet developed for this work.

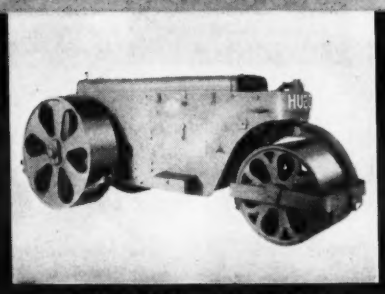
MONARCH ROAD MACHINERY COMPANY
Front & Douglas N. W., Grand Rapids 4, Michigan

THERE'S MORE TO HUBER ROAD MACHINERY THAN MEETS the EYE

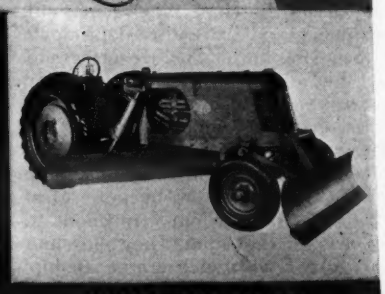
There is Huber's many years of know-how in building dependable, speedy, and long lasting 3-wheel and Tandem Rollers, which has played such a vital part in the outstanding success of the Huber one-man-operated Maintainer. There is Huber's expert knowledge of road machinery application and the needs of the vast road building fraternity. Then there is Huber's network of strategically located Distributors who know the local picture and who augment Huber's sincere desire to serve. All of these are behind every piece of Huber Road Machinery you buy. And that is why you can buy Huber Rollers and Maintainers with confidence.



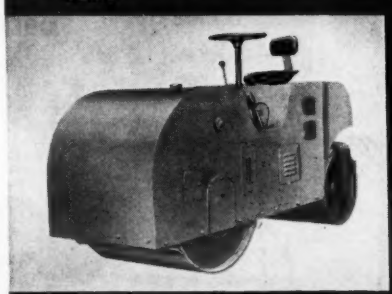
HUBER 5 and 6 TON — 3 Wheel Roller



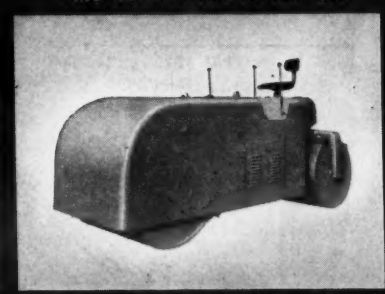
HUBER 8 TON — 3 Wheel Roller
Also built in 10 - 12 Ton Size



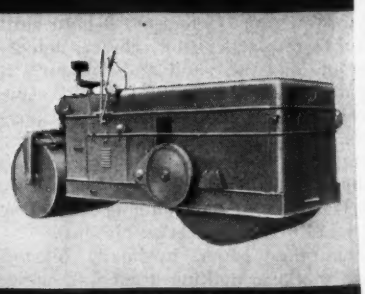
HUBER — Maintainer



HUBER 3-4 TON Variable Weight Tandem Roller



HUBER 5-8 TON Variable Weight Tandem Roller



HUBER 8-12 TON Variable Weight Tandem Roller

THE HUBER MFG. COMPANY • MARION, OHIO, U. S. A.

HUBER

3 Wheel • Tandem
ROAD ROLLERS and MAINTAINERS

C. & E. M. Photo
Reinforced-concrete pipe for the San Diego aqueduct has been laid in place and backfilled to the springline. Dirt has been carried up to the top of the pipe at the joints to give some weight on the asphaltic paper when grouting is done.

Pipe Line Laid 21 Miles In Mountain Country

(Continued from preceding page)

two work vises, and a 30-foot workbench 4 feet wide complete the picture.

"It's just a place where we do monkey-wrench work," laughed Bob Neely, the Shop Foreman. "It's far better for the company to have heavy repair done at Baldwin Park, where it has the facilities."

Drinking water is dispensed at this yard through Dixie sanitary paper cups, and water bags serve the far-flung units of digging equipment now scattered for 20 miles through the mountains of San Diego and Riverside Counties.

A portable fuel and lubrication unit, mounted on a 6-wheel-drive International truck, calls on the equipment once each day to service each unit with fuel and grease.

Personnel

The entire aqueduct project, from San Jacinto to San Vicente, includes six contracts other than the one described here. It is under the supervision of Captain A. K. Fogg, CEC, USN, District Public Works officer, assisted by Commander R. D. Thorson, CEC, USN, Resident Officer-in-Charge; Lieut. Comdr. Frank M. Hines, CEC, USNR, and Lieutenant D. A. Gray, CEC, USNR, are Division Engineers.

Harold Pope of Hollywood, Calif., is the Project Manager for United Concrete Pipe Corp. Ethan A. Smith of Inglewood, Calif., is Superintendent. Various foremen under Superintendent Smith include Orville Showalter, Equipment; Oscar Goddard, Powder; Sam Preston, Compaction; S. E. Brooks, Drilling; Frank Codgill, Fine Grade; Nick Ban, Pipe Placing; and S. J. Jones, Office Manager.

The job is slightly behind schedule due to the delay in securing steel reinforcement for the concrete pipe. But now that the pipe is rolling out to the job on schedule, a concentrated effort is being made to speed the work. Navy and contractor personnel alike hope to see this important link of the new water-supply line successfully finished before the contract completion date of July 13, 1947.

Turner Elects Officials

Two new officials have been elected by the Turner Construction Co. of New York City, effective March 17. They are H. C. Turner, Jr., President, and Robert C. Wilson, Chairman of the Board.

Mr. Wilson has been a Vice President since 1919 and a Director since 1928. Mr. Turner has been a Director since 1932 and a Vice President since 1938. He succeeds Admiral Ben Moreell, who has resigned to go with the Jones & Laughlin Steel Corp., Pittsburgh.

Portable Generator

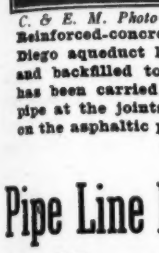
The reconversion to civilian duty of a specially designed war-model portable generator has been announced by Griffin Equipment Corp., 881 E. 141st St., New York 54, N. Y. The unit is adapted to construction uses for floodlighting, engine starting, battery charging, and the operation of small tools.

It is equipped with a 12 or 24-volt dc generator, a 110-volt ac generator, and four 1,000-watt floodlights mounted on standards for raising and lowering. Combined in the same unit, is a small air compressor which can be used for inflating tires and similar uses.

Power is furnished by a Wisconsin 4-cylinder air-cooled gasoline engine with a 6-volt electric starter and battery-charging generator. The generators have a capacity of 5 kw. The air compressor delivers air at a pressure of 125 to 150 psi, and has a capacity of 7½ to 10 cubic feet.

This Griffin electric-power plant is equipped with a 12 or 24-volt dc generator, 110-volt ac generator, and four 1,000-watt floodlights.

Further information may be secured from the company, or by using the enclosed Request Card. Circle No. 54.



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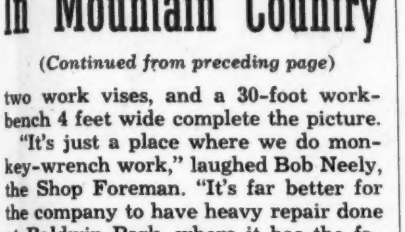

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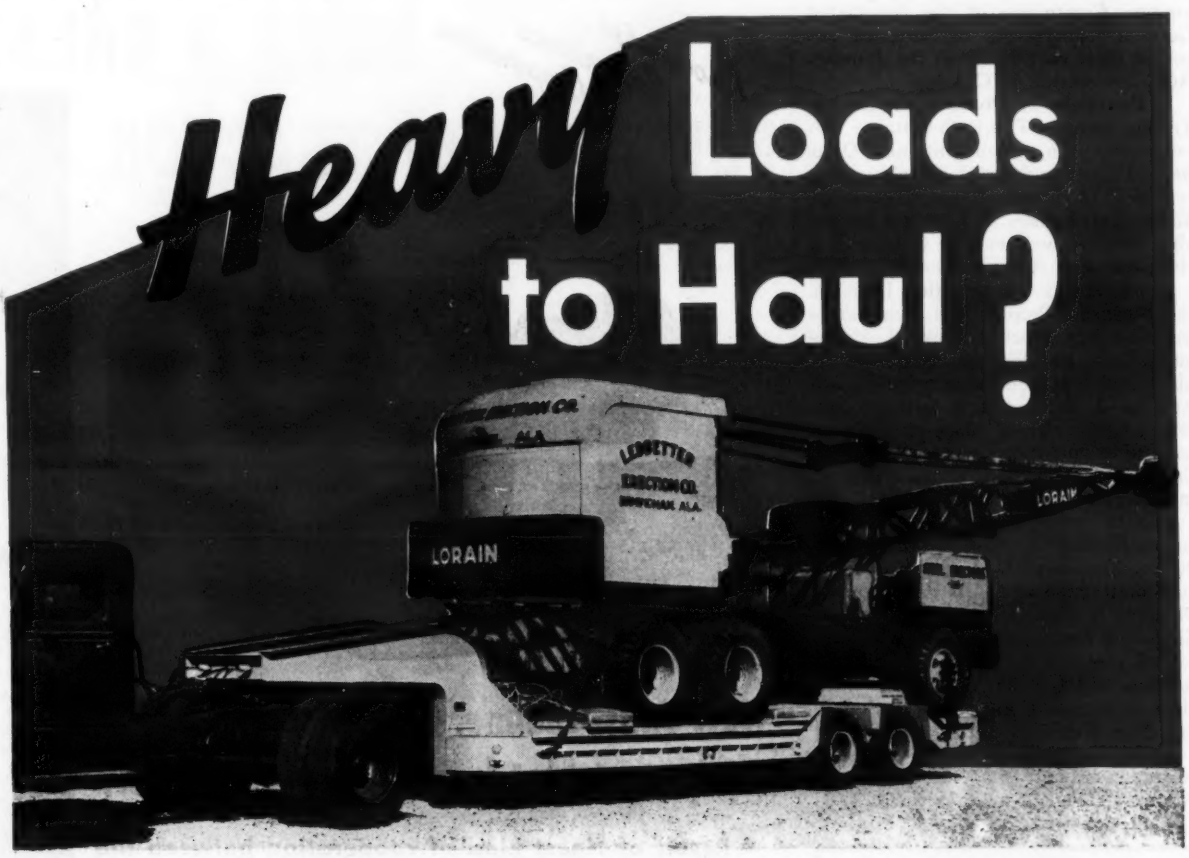

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When you have to move heavy pieces of equipment to a job . . . the best way . . . the most economical way . . . the fastest way . . . is with a Fontaine Low-bed Trailer. It will pay for itself on a few jobs and will last almost forever. Get the model that suits your needs.

Write for catalogue and name of nearest distributor

TRAILER DIVISION
Fontaine Truck Equipment Co., Inc.
3829 First Ave., North Birmingham 6, Ala.

British Combine Photos

Here are three views of construction now under way at the Orly Airport near Paris, France. French laborers handle the huge stones which will serve as runway foundation. A Caterpillar tractor hauls sheepsfoot rollers along a strip of runway to secure compaction. And three of the concrete mixers used on this project are shown. Orly is destined to be the largest airport in the world when completed about 1950, at an estimated cost of 20,000,000,000 francs. Its airport buildings will be located in the center of a tangential system of 10 concrete runways, each 1½ to 2 miles long and from 328 to 164 feet wide. This radiating design will enable airplanes to land no matter what the wind direction, and with the simultaneous use of two runways. There will be 25 connecting strips between runways, with repair shops, storage, warehouses, etc., at their junctions. Facilities are planned for more than 330 planes to move in and out in rush hours and 2,800 to 3,000 arrivals and departures per day.

Safety Awards Made At AGC Convention

Winners in the Accident Prevention Contest sponsored by the Accident Prevention Committee of the Associated General Contractors of America received their certificates at the January AGC convention in Chicago.

In the Highway Division, the Zachry Trophy went to The Bellefontaine Development Co., Bellefontaine, Ohio. Second place and first honorable mention went to Herbert Reese, Greenbush, Minn. Third place and second honorable mention was won by Colglazier & Hoff, Inc., San Antonio, Texas.

In the Heavy-Construction Division, the Swenson Trophy was awarded to the Newbery Electric Corp., Los Angeles, Calif., and Phoenix, Ariz. Second place and first honorable mention was won by J. A. Terteling & Sons, Inc., Boise, Idaho. Third place and second honorable mention went to E. F. Cramer Construction Engineers, Inc., Indianapolis, Ind.

Awards were also made for companies having the best records among the contestants with above the average man-hour exposures. In the Highway Division, first place went to Allegheny Asphalt & Paving Co., Pittsburgh, Pa.; second place to H. B. Zachry Co., San Antonio and Laredo, Texas; and third place to Burrell Construction & Supply Co., New Kensington, Pa.

In the Heavy-Construction Division, awards went to Booth & Flinn Co., Pittsburgh, Pa.; The Fluor Corp., Ltd., Los Angeles, Calif.; and The Holmes Construction Co., Wooster, Ohio.

Certificates for no lost-time accidents went to Bellefontaine Development Co., Bellefontaine, Ohio; Blair Construction Co., Omaha, Nebr.; Artie Gregory, Little Rock, Ark.; J. T. Ryan, Oelwein, Iowa; and George K. Werner & Son, Clay Center, Nebr., Highway Division; and to E. F. Cramer Construction Engineers, Inc., and F. A. Heckendorf, Littleton, Colo., Heavy Division.

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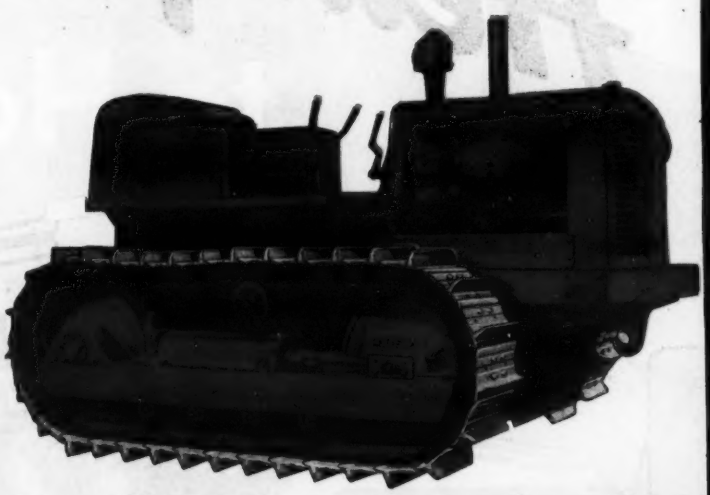

New Allis-Chalmers HD-5 and Its Allied Equipment Match Fully and Completely

- Result of finest kind of cooperation between the various Allied manufacturers and the entire Allis-Chalmers organization, its dealers and users.
- Backed by the knowledge, experience, and facilities of each manufacturer . . . each skilled in his own field . . . each firmly established in his own right.
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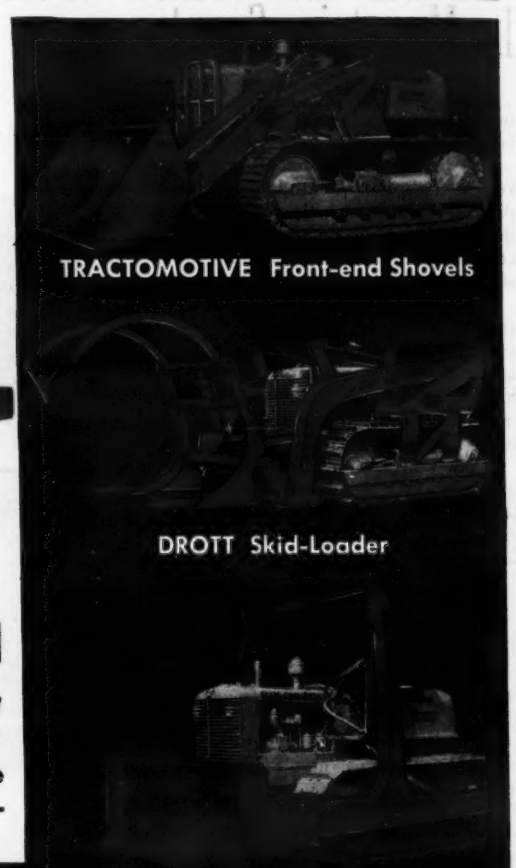
- Both tractor and equipment sold and serviced by the same organization — exclusively by Allis-Chalmers dealers throughout the country.

Yes, the HD-5 with any Allied unit is a fully matched power package . . . matched for greater output at lower cost.

RUGGED! TOUGH! DEPENDABLE!



ALLIS-CHALMERS

TRACTOR DIVISION • MILWAUKEE 1, U. S. A.

Quick, Positive Braking Features Line of Trailers

The Dorsey line of trailers for transporting equipment and materials is described in a bulletin available for the asking from Dorsey Trailers, Elba, Ala.

The bulletin covers the Models D and E trailers in 13 to 18-ton capacities; Model C straight-frame trailers in 12 to 15-ton capacities; Model DT utility tandem trailers in 6½ to 8½-ton capacities; Models M-20 and M-5 of 20 and 15-ton capacities, respectively; Model C-511 utility pole trailer; Model S truck-driven skidder.

The trailers are all said to feature engineered rear-axle assemblies, rugged landing gears, semi-automatic fifth wheels, and Dorsey brakes which, the company states, make the trailer handle like a passenger car.

Copies of this literature may be obtained from the company. Or use the enclosed Red Request Card. Circle No. 67.

Testing-Machine Line

A line of universal testing machines is described in Bulletin 30 issued by the Tinius Olsen Testing Machine Co., 500 No. 12th St., Philadelphia 23, Pa. These machines are used for testing tension, compression flexure, or bend.

Tinius Olsen machines employ the pendulum-lever type of weighing system, which is explained in the text. The advantages claimed for it are described, and a force diagram of the loading action is used to amplify the discussion.

Machines in capacities up to 1,000,000 pounds are available with either hydraulic or electro-mechanical loading systems. Special loading machines and accessories are also listed in the catalog. These include the special L-type machines, extensometers, proving rings, and electronic recorders.

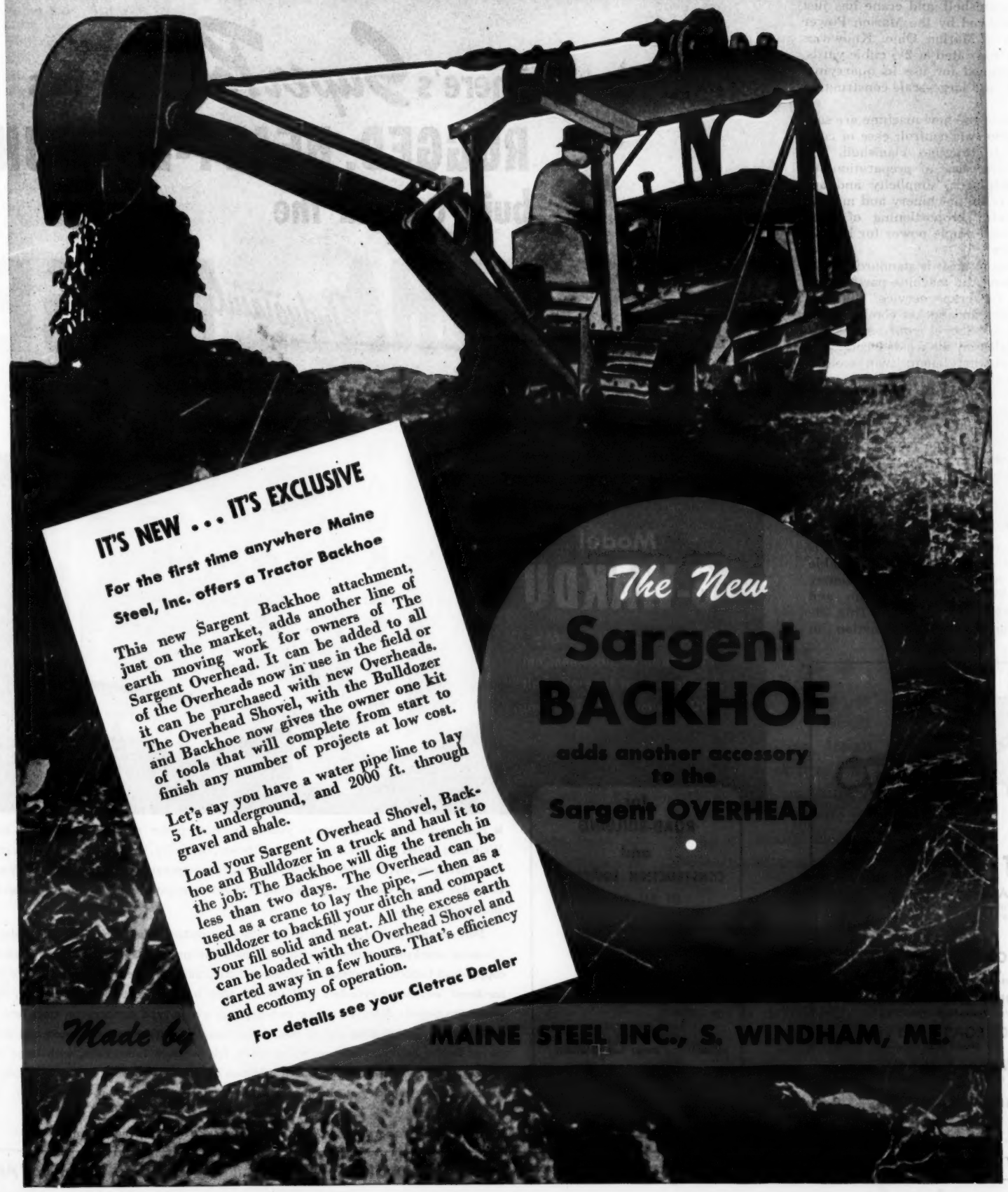
Copies of this literature may be obtained from the company. Or use the enclosed Red Request Card. Circle No. 62.

West-Coast Firm Moves

The Gardner-Byrne Construction Co., a California corporation, has announced a new address: 649 So. Olive St., Los Angeles 14, Calif. The firm handles highway and airport construction, as well as the design and manufacture of specialized construction equipment. Officers of the company are Russell W. Byrne, President; Adryl W. Gardner, Vice President; and Raymond S. Mullen, Secretary-Treasurer.

The firm of Gardner-Byrne Construction Co., a co-partnership formerly located at Redlands, Calif., has been dissolved.

Here it is at Last!


IT'S NEW . . . IT'S EXCLUSIVE
For the first time anywhere Maine Steel, Inc. offers a Tractor Backhoe
This new Sargent Backhoe attachment, just on the market, adds another line of earth moving work for owners of The Sargent Overhead. It can be added to all of the Overheads now in use in the field or it can be purchased with new Overheads. The Overhead Shovel, with the Bulldozer and Backhoe now gives the owner one kit of tools that will complete from start to finish any number of projects at low cost.
Let's say you have a water pipe line to lay 5 ft. underground, and 2000 ft. through gravel and shale.
Load your Sargent Overhead Shovel, Backhoe and Bulldozer in a truck and haul it to the job. The Backhoe will dig the trench in less than two days. The Overhead can be used as a crane to lay the pipe, — then as a bulldozer to backfill your ditch and compact your fill solid and neat. All the excess earth can be loaded with the Overhead Shovel and carted away in a few hours. That's efficiency and economy of operation.
For details see your Cletrac Dealer
The New
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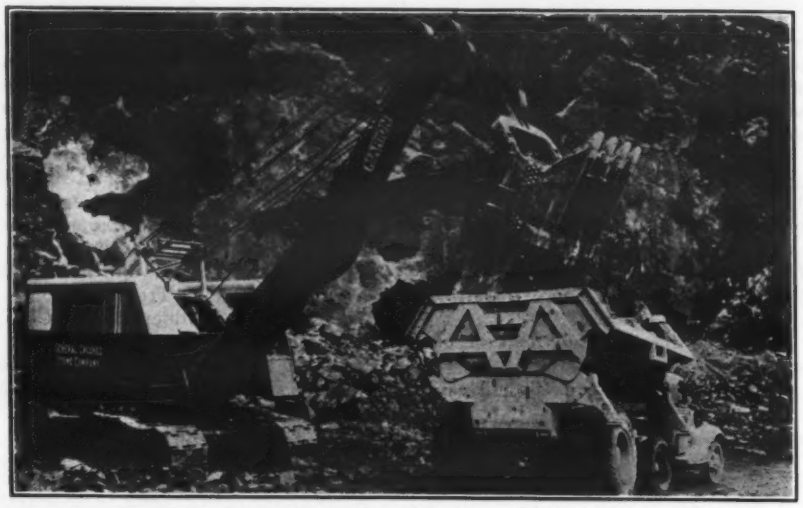


An action view of the new Marion 93-M, a 2½-cubic-yard heavy-duty shovel, dragline, clamshell, and crane.

New Shovel, Dragline, Clamshell, and Crane

A new heavy-duty all-purpose shovel, dragline, clamshell, and crane has just been announced by the Marion Power Shovel Co. of Marion, Ohio. Known as the 93-M, it is rated at 2½ cubic yards, and is designed for use in quarrying, rock work, and large-scale construction projects.

Features of the new machine are said to be: Marion air control; ease of convertibility to dragline, clamshell, and crane service; ease of preparation for railroad shipment; simplicity and accessibility of all machinery and moving parts; careful proportioning of construction; and ample power for heavy-duty service.

A live-boom hoist is standard equipment, making the machine particularly adaptable for crane service. Varying boom lengths and bucket combinations are available. Shovel front-end equipment includes an all-welded rounded-edge box-section boom; twin welded full box-section dipper handles; and a heavy-duty manganese-steel front dipper with inserted socket-type dipper teeth.

Further information may be secured from the company, or by using the enclosed Request Card. Circle No. 53.

Line of Pipe Fittings

The line of WeldOlet pipe fittings is the subject of a catalog now available from the manufacturer, the Bonney Forge & Tool Works, Durham and Meadow Sts., Allentown, Pa. This 20-page catalog contains information on the application of the branch-pipe outlet fittings, as well as structural data, installation procedure, temperature-pressure rating charts, and specifications. Bulletin WT. 46 also illustrates and describes drain-out fittings and the company's line of flanges.

Copies of this literature may be obtained from the company. Or use the enclosed Red Request Card. Circle No. 63.

Post-Hole Digger

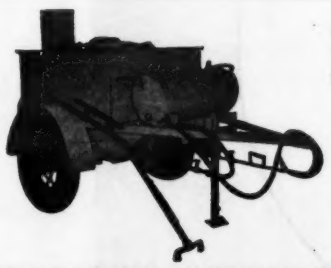
A portable earth-boring machine for digging post holes, holes for roadside planting, and similar uses, is manufactured by Ka-Mo Tools, Inc., 2121 So. Troy St., Chicago 23, Ill. It is air or electric-operated and is handled by two men.

The company claims that it will put down efficiently a 3 to 16-inch hole 30 to 40 feet deep in mud, sand, or clay without grabbing, and that it will drill at any angle. Power is supplied by either a 3-kw dc or a 5-kw dc generator, which can be mounted on a two-wheel dolly so that it can be transported easily.

Heavily loaded large-diameter drills can be removed by use of a tripod, with the drum either hand-cranked or run by the drill motor.

The Ka-Mo post-hole digger, shown here, is said to put down 3 to 16-inch holes in mud, sand or clay.

Further information may be secured from the company, or by using the enclosed Request Card. Circle No. 21.



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There's SuperPower in this
RUGGED, HEAVY-DUTY UNIT
built around the
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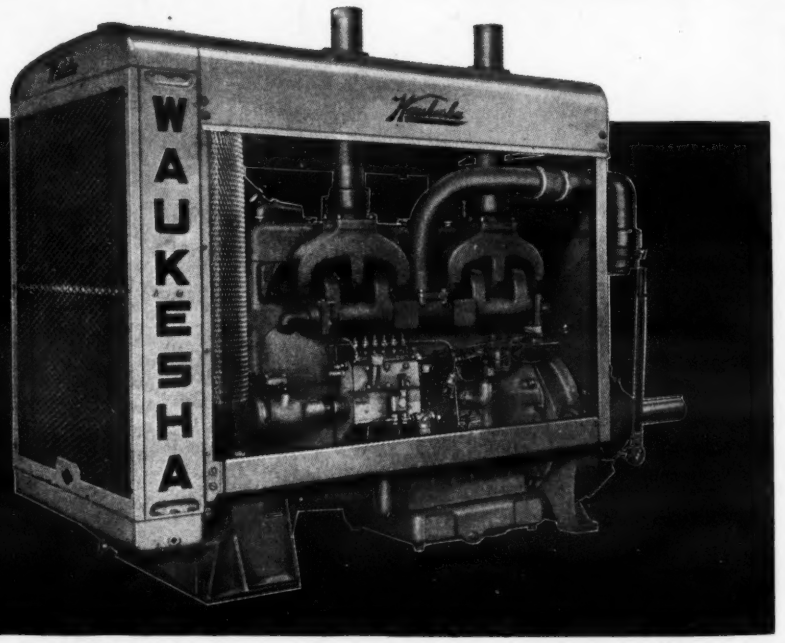

Model
6-WAKDU
Six cylinders, 6¼" x 6½", 1197 cu. in. displacement, net horsepower at take-off shaft 190 maximum, at 1300 rpm.

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OF ALL KINDS
Shovels • Cranes
Hoists • Mixers
Rollers • Graders
Bulldozers
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■ Here, indeed, is the answer to your heavy-duty power requirements—a big, four-cycle Waukesha Diesel that combines abundant power, flexibility, smoothness and acceleration with high fuel economy, long life and low upkeep. It incorporates the advantages of Waukesha's extensive wartime experience in building heavy-duty engines, plus 20 years of Diesel research and development.

Performance-proved features built into this modern Waukesha Diesel include: husky, 7-bearing crankshaft, equipped with 4¾" main bearings and 3¾" crankpins in steel-backed, copper-lead babbitt; crankshaft journals and crankpins hardened to 600 Brinell for long life; hardened, wet-sleeve cylinders of Waukesha alloy iron, tested to 350-400 Brinell; oil cooled aluminum pistons fitted with four non-sticking, wedge-type compression rings and two oil control rings; full-floating piston pin, more than 2" in diameter, hardened and lapped to mirror finish; hardened exhaust valve seats; full pressure lubrication, with large capacity filters and oil cooler; American Bosch injection equipment. Gasoline-engine starting insures ample cranking capacity at all times, with prompt starts even in sub-zero weather. Electric cranking if preferred.

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County Does Highway Job With Own Forces

County Takes Over F.A.S. Project On Contract Basis When Bids Run Over Estimate by Almost One-Fourth

✦ IN the Upper Peninsula of Michigan, Gogebic County highway crews have been working under the supervision of George W. Koronski, County Highway Engineer. They have widened and surfaced a 15-mile section of secondary highway extending north from Thomaston to the Porcupine Mountain area. Work on this $77,000 F.A.S. project was undertaken by the County Highway Department on a contract basis, when the lowest bid submitted by contractors overran estimates by $20,000.

"Estimates on this job were reasonable, with due consideration given present costs and a fair profit," declared Mr. Koronski. "Maybe the contractors were too busy on other jobs. Anyway, we did the work."

Over the rolling countryside, the old 24-foot highway was widened and resurfaced. The narrow 1-foot ditches were replaced with 3-foot-bottom ditches 2 feet in depth. And new shoulder slopes of 4 to 1 were built. Backslopes along the rebuilt highway run 1 to ½.

Work on the job was started early in the fall of 1946, with 45 men working an 8-hour shift 5 days a week. A Michigan and a Northwest 1-yard shovel were placed in ditches to excavate the 25,000 cubic yards of soil for the shallow ditches and flattened slopes. Necessary shaping was done with a Galion motor grader.

Gravel Surfacing

Over the widened highway, 26,000 tons of ¾-inch gravel were laid for a wearing course. At the gravel pit, a 1⅛-yard Koehring loaded borrow material to a new Pioneer 40-V crushing and screening plant. This plant had a 10 x 36-inch jaw crusher, 40 x 32-inch roll crusher, and 4 x 12-foot vibrator screen. It ran about 1,000 tons of aggregate per 8-hour day. A Murphy diesel 250-hp power unit was used.

Gravel was hauled in seven or eight 2-ton dump trucks an average of 5½ miles to the highway; the trucks made between 14 and 15 trips during each 8-hour day. The wearing course was spread in two layers with a spreader box, and leveled on the roadway with the Galion grader.

The resurfaced highway will furnish a good secondary road to the gateway of the scenic Porcupine Mountain area on the shores of Lake Superior.

Two-Way Radio Shown At Highway Meeting

A demonstration of two-way radio adaptable to highway use was put on at the December meeting of the American Association of State Highway Officials in Los Angeles. The stations were set up in the Biltmore Hotel, and contact was maintained with mobile units in the Los Angeles area.

An interesting feature of the demonstration was that the AM station was made entirely from war-surplus radio equipment. Broadcasts were made with both FM and AM. Due to topographical features of the western coast, the latter is used most in that region.

The AM station broadcast on 2,726 kc to a maximum of 100-watt power. The operating range during daylight hours was approximately 100 miles, although in the evenings, stations as far away as 600 miles were contacted. The FM station had 45 watts; its range was limited to 20 to 40 miles as no repeater-receiver was used.

C.-& E. M. Photo

This Pioneer 40-V screening and crushing plant saw its first service on the 15-mile widening and resurfacing project of Gogebic County, Mich.

ARBA Appoints Blakeley

A new Managing Director of the Highway Contractors' Division has been appointed by the American Road Builders' Association. Recently discharged from the Army, in which he saw 56 months of consecutive overseas service, Harry E. Blakeley assumed his new post on March 1. A graduate of Georgia Tech, Col. Blakeley has taught civil engineering, and held various other engineering positions.

Blakeley replaced Burton F. Miller, who resigned to become Executive Secretary of the Michigan Road Builders' Association.

BE WISE! *Modernize Now with* LAPLANT-CHOATE RIGS

Hunter Construction Co. of Ada, Oklahoma, is another of the hundreds of smart earthmovers who are finding that modern LaPlant-Choate scrapers move more dirt at less cost—even with old tractors. Note the heaping load being handled by this LaPlant-Choate C-114 on a highway relocation job near Ardmore, Oklahoma.

Why gamble with inefficient pre-war scrapers when you can get modern LPC's in a hurry!

The old story about "trying to do *tomorrow's* jobs with *yesterday's* equipment" is *doubly* true of scrapers—because it's the scraper that handles the payload, which in turn controls your profit on every job. Consequently, in times like these, it just doesn't pay to struggle along with inefficient, old style scrapers that waste valuable pay yardage, burn up tractor power and require excessive maintenance. Far better to replace those old "relics" *now* with modern LaPlant-Choate units—proved by competitive tests to be the *easiest loading, fastest spreading scrapers on the market.* This way you'll get higher average production at lower over-all cost and thanks to LPC's modern open top design, which simplifies loading with shovel or dragline, you'll also be able to use your scrapers for utility hauling and spreading. Best of all, LaPlant-Choate scrapers in most sizes (from 2 to 14 yd. struck measure) are ready for *immediate delivery.* So don't delay. Better get complete facts today from your nearest LPC distributor. LaPlant-Choate Manufacturing Co. Inc., Cedar Rapids, Iowa; 1022 77th Ave., Oakland, California.

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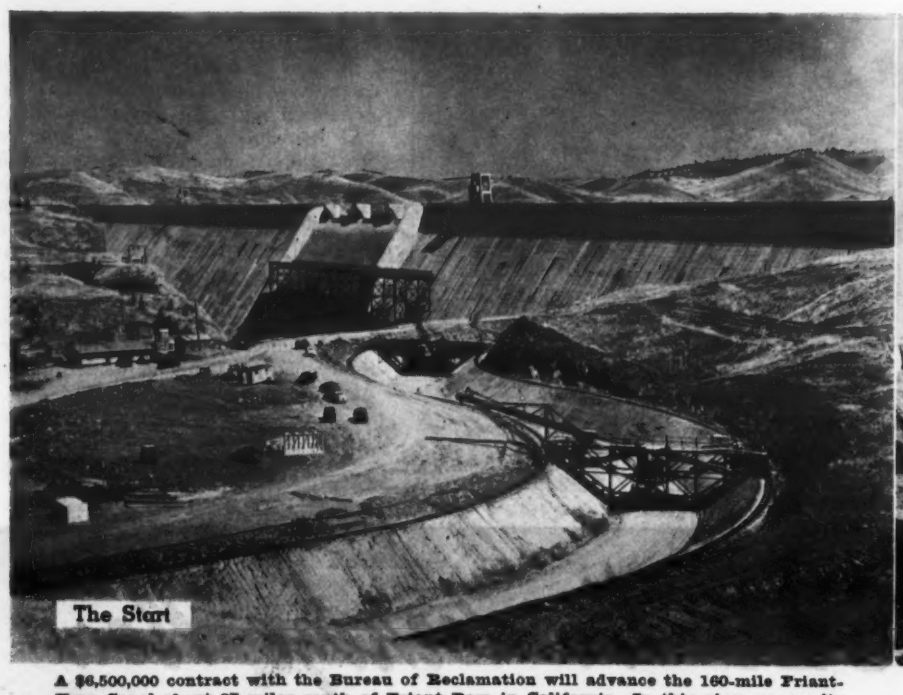


A $6,500,000 contract with the Bureau of Reclamation will advance the 160-mile Friant-Kern Canal about 37 miles south of Friant Dam in California. In this view we see its winding start from the dam, and the trimmer and concrete-lining machines which were specially designed for the job.

The Friant-Kern Canal will have a bottom width of 36 feet and a top width of [illegible] feet. About 40 per cent of the excavation on this contract is in hard-rock formations which require drilling and blasting. Here are two of the four Ingersoll-Rand wagon drills used in rock cuts. That is petrified redwood in the foreground.

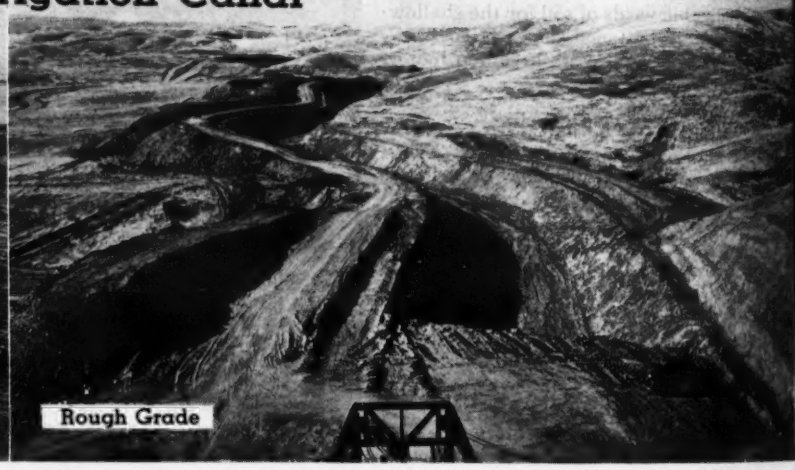
Friant-Kern Canal

Special Equipment Used on $6,500,000 Contract for 37-Mile Section of Irrigation Canal

(Bureau of Reclamation Photos)

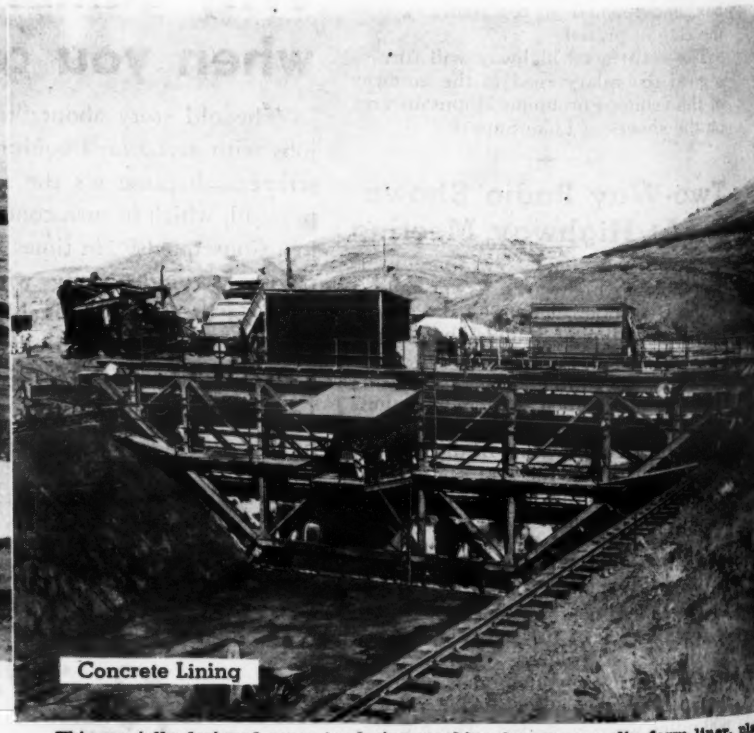
(See article on page 6)

Tractor-scraper outfits handle the earth-moving. Here they are building up compacted levees where the canal passes through a "fill" section.

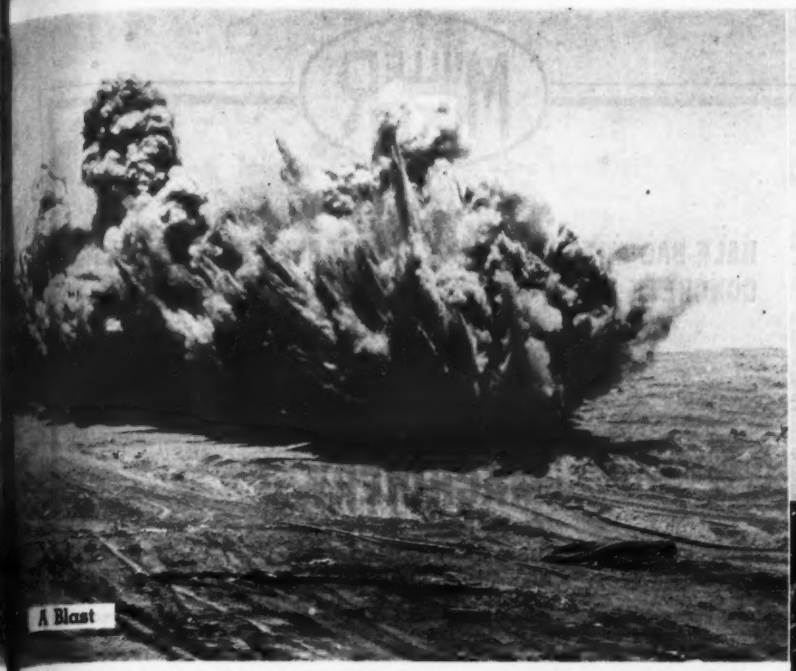


This view, taken from the top of the boom of the walking dragline, shows the winding course on the canal. Rough excavation has been completed in this section.

In the distance is the special trimmer—first in the line-up of rail-mounted equipment. Embodying the endless bucket-chain principle, its buckets deliver to a 36-inch conveyor which is shown dumping the excess dirt clear of the canal. Sides and bottom are thus left smooth and ready for the concrete. Next in line is the concrete-placing machine, from the rear of which workers finish the concrete lining by hand. The next unit is used for cutting the contraction joints. Then comes the jumbo from which the asphaltic joint compound is applied. Last in line is the concrete-curing unit.

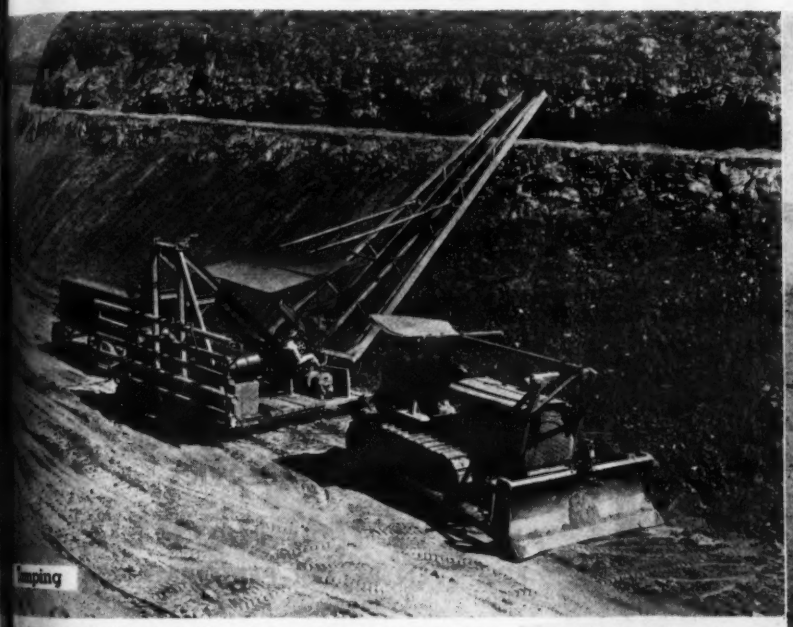


This specially designed concrete-placing machine, known as a slip-form liner, places 3½-inch concrete lining on the bottom and sides of the canal. Rodgers hydraulic jacks at the corners are used to adjust the machine. Steel stakes along the rails carry a piano wire at grade level.

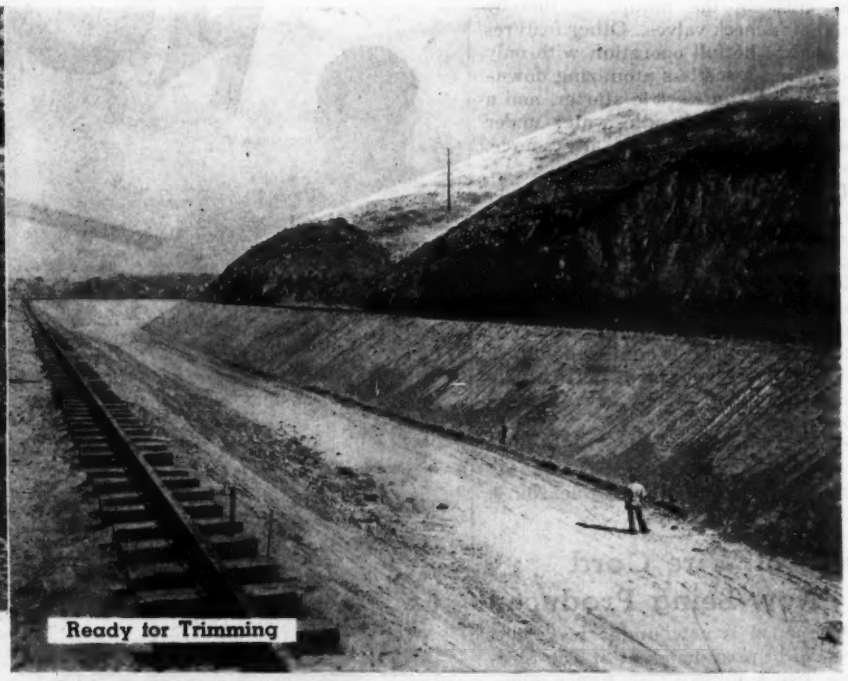


In one 500-foot section of canal, dynamite charges were placed in 391 holes. This blast contained 11,700 pounds of du Pont 60 per cent gelatin, of which 1,000,000 pounds was purchased for the job. Stored 2 miles away, it is brought out only when the holes are ready to load. Blasting caps are stored and handled separately.

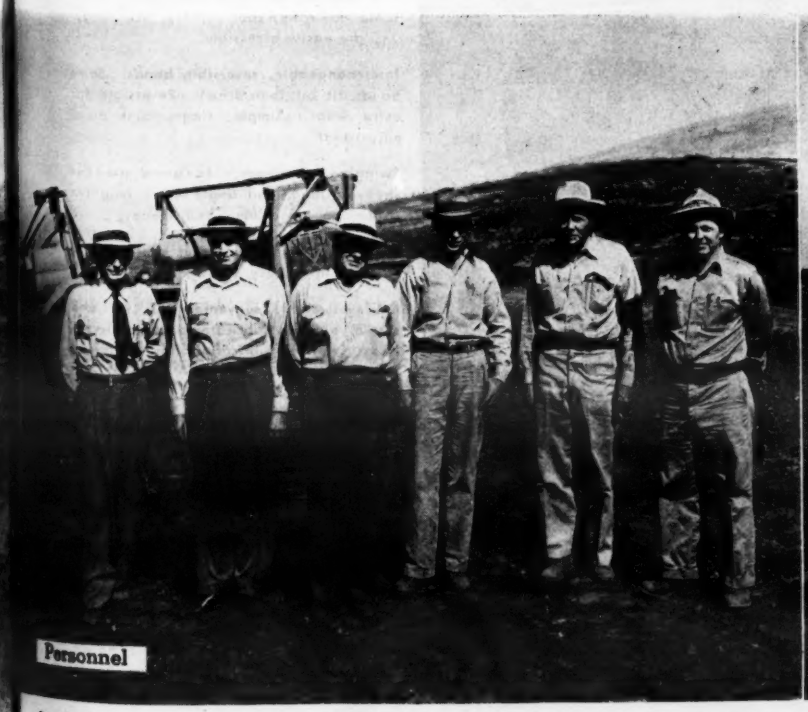
The first heavy-duty excavator moved onto the job was this Bucyrus-Monighan 5W walking dragline. It was put into service handling heavy blasted rock, and has been averaging two swings a minute.



...ock cuts, selected backfill is tamped in place over slopes excavated through rock. ...special unit was designed to provide compaction of 95 per cent of laboratory den... or better. Earth is dumped along the slope by a dragline, and the tamper foot ...moved, by means of an Ingersoll-Rand air hoist, along the boom in an up-and-down ...Mounted on skids, the unit is towed by a D8, but the tamper operator gives the signals for all moves, for both efficiency and safety.



Slopes on this section of the Friant-Kern Canal, running through a rock cut, have been compacted and are ready for the trimmer. The rails have been laid on either side, ready to carry the trimming and concreting machines.



Among the men responsible for this irrigation-canal project are, left to right, Gilbert H. Hogue and R. K. Durant, both Bureau of Reclamation Engineers; R. B. Williams, Construction Engineer for the Bureau of Reclamation; A. M. Willis, Excavation Foreman for the contractor; K. C. Wasson, Superintendent; and Bureau of Reclamation Engineer Harry Jenson.

This view shows the section of the Friant-Kern Canal nearest Friant Dam with the concrete lining completed. Designed for an initial carrying capacity of 4,000 cfs, with enough freeboard to handle 5,000 cfs, this man-made river will end 160 miles away, near Bakersfield. It is only a part of the Bureau of Reclamation's comprehensive plan to develop California's Central Valley.

This portable steam cleaner is designed for the speedy automatic cleaning of equipment, motor parts, etc.

Steam Cleaner Gives Steam in One Minute

A new portable automatic steam cleaner has recently been announced by D. C. Cooper Co., 1467 So. Michigan Ave., Chicago 5, Ill. Said to deliver steam in one minute, it can be used to cut grease from auto chassis, motors, floors, walls, racks, equipment, etc.

It is designed to pass the cleaning compound to the heating coils without first entering the pump; it thereby eliminates check valves. Other features are said to be full operation with only two valves, a sootless atomizing downdraft burner, an electric starter, and a pump which will handle water under pressure or suck it from any source, the company says.

The Cooper steam cleaner will operate on either fuel oil or kerosene. Fuel consumption is said to be between 2 and 3 gallons of oil an hour. The fuel tank holds 11 gallons; the cleaning-compound tank holds 15 pounds of compound. The capacity of the cleaner is listed at 100 gph. It is equipped with 25 feet of oil-resistant steam hose, a balanced steam gun, and 15 feet of waterproof drop line.

Further information may be secured from the company, or by using the enclosed Request Card. Circle No. 2.

Tires of Wire Cord Now Being Produced

Production is now under way on a wire-cord tire at the plant of The Firestone Tire & Rubber Co., Akron, Ohio. It is recommended by the company for fast highway trucking and special off-the-highway service.

Wire, as considered in a tire, has zero stretch; each strand must be placed exactly in its proper position, therefore, with no leeway possible. Wire-cord tires are built in the same way and with the same machinery as standard tires, Firestone says, with the exception that fewer plies are required. The wire cord used is 0.036 inch in diameter; it is built up from several strands whose diameter is 0.0058 inch. Roughly, a 9.00 x 20 tire contains about 55 miles of these strands or about 28 pounds of steel.

Three characteristics of the metallic cord which are said to make it desirable for use in tires are: (1) high sustained strength under high temperatures; (2) negligible stretch under load; and (3) the ability to dissipate heat away from the normally vulnerable points, as a result of the greater conductivity of the wire construction.

Maintenance practices for this type of tire are rigid. They must be inspected regularly for cuts and snags and the necessary repairs made immediately. Best results are obtained in dual operations when the wire-cord tires are installed as matched sets, and in no case should their diameters vary more than ¼ inch. Tire pressures should be approximately 30 per cent higher than for cotton or rayon tires of the same size. Tires may be repaired in the usual manner. They may also be retreaded, with or without reinforcing.

Further information may be secured from the company, or by using the enclosed Request Card. Circle No. 52.

Concrete-Handling Tools

A pocket-size folder which describes concrete vibrators and other concrete-handling and finishing tools can now be obtained from the Mall Tool Co., 7730 So. Chicago Ave., Chicago 19, Ill. The pamphlet lists the advantages of vibrated concrete and describes the Mall line of vibrators.

Some models have 1½ or 3-hp gasoline engines. Others are 1½-hp electric-driven units. There is also a pneumatic model. Additional pieces of equipment listed in this bulletin, Form No. 449, include surfacers, rubbing units, tuck pointer's saws, water tanks for rubbing machines, replacement heads, grinders, and others.

Copies of this literature may be obtained from the company. Or use the enclosed Red Request Card. Circle No. 92.

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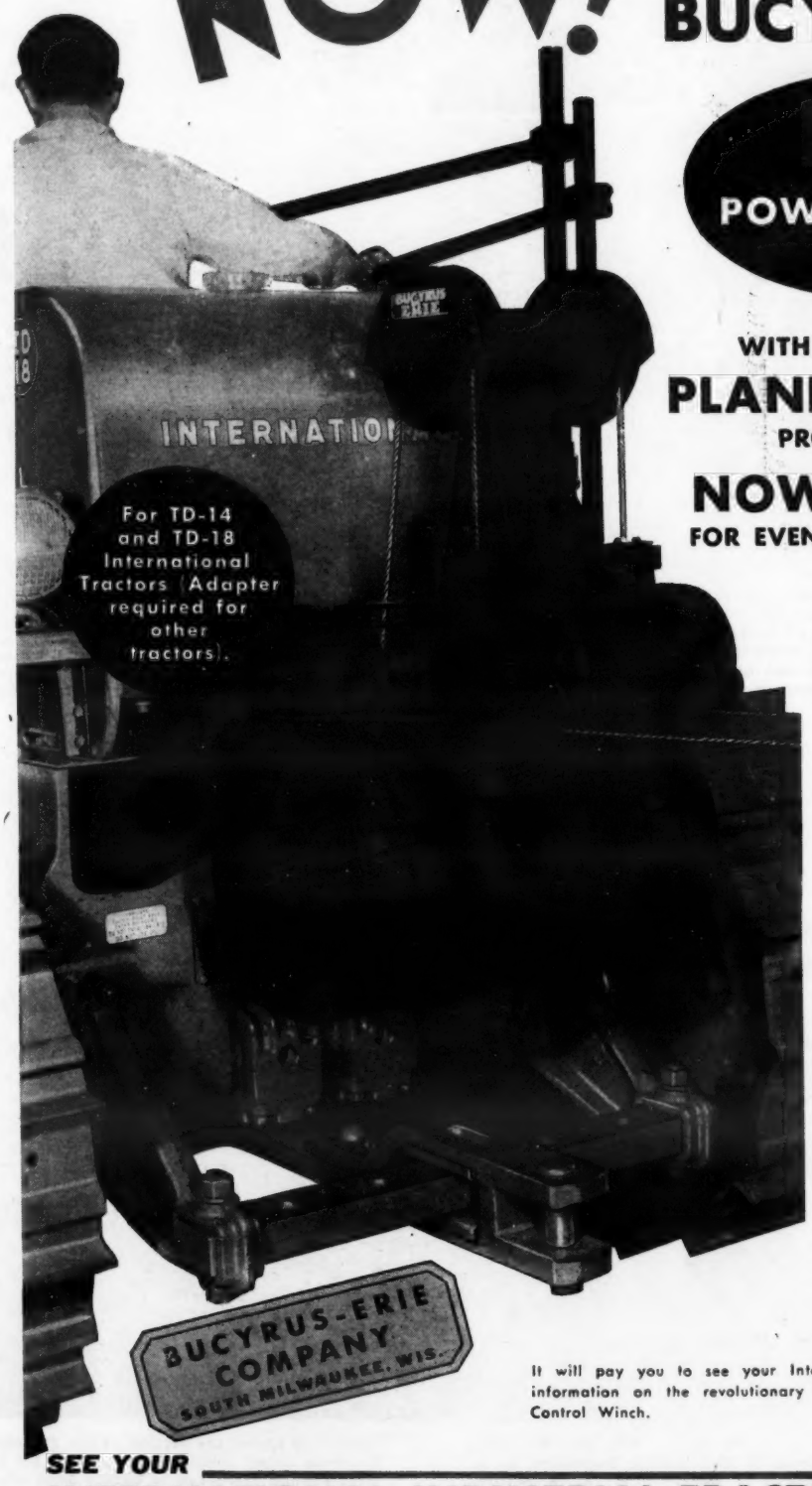
NOW! The New BUCYRUS-ERIE P-25 POWER CONTROL WINCH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Swinging fairleads, large-diameter sheaves, long lead angle — all lengthen cable life, save time and money.

Non-slip wedge and socket cable anchor is accessible, easy to set, safe.

Oil-level sight, convenient oil fill and single, oil-bath lubrication assure simplified, positive lubrication for sustained efficient performance.

Anti-friction bearings. All rotating parts are mounted on anti-friction bearings for extra smoothness and durability.

Single-lever control of brake and clutch means easy handling, positive action, smooth operation. Automatic interlocking prevents dropping load. "Free" position for reeving up, installing new cable. Adjustable levers held rigidly by wide spaced double bearings.

It will pay you to see your International tractor distributor for complete information on the revolutionary Bucyrus-Erie P-25 Planetary Drive Power Control Winch.

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Eight Concrete Lanes Replace 50-Foot Road

Heavily Traveled Highway Is Rebuilt For 3.3 Miles; Five Contracts Amount to Over $3,000,000

WHAT is generally regarded as the country's most heavily traveled highway is now being reconstructed along a 3.3-mile section at a total cost of $3,292,596.52. On this road through northeastern industrial and metropolitan New Jersey, traffic counts have recorded the passage of 102,000 vehicles in 24 hours. It is practically always jammed bumper to bumper with cars and trucks. It carries the highway-marking designation U. S. 1, U. S. 9, and State 25. And it is the scene of more bottlenecks and delays to tourists, truckers, and the traveling public than possibly any highway anywhere.

The section under construction, with an existing pavement only 50 feet wide, starts at Port Street, near the Newark Metropolitan Airport; it ends at Elizabeth, 4,589 feet beyond the Newark-Elizabeth City line. Originally the entire 3.3-mile stretch was advertised by the New Jersey State Highway Department as a single contract. But the bids received were considered excessive. So the project was divided into four paving and a single lighting contract, the latter covering the entire section. Included in the paving contracts are five grade-separation structures, and the laying of a 91-inch reinforced-concrete pipe culvert supported on wooden piles.

The new highway measures 152 feet between curbs. It has 8 lanes of 10-inch reinforced concrete, four for northbound and four for southbound traffic, separated by a 12-foot parkway strip depressed 6 inches at the center. The four lanes going in the same direction are further divided into two lanes for local and two for through traffic by a 2-foot double reflecting curb. The through traffic in each direction adjoins the topsoiled and seeded center parkway which has a 24 x 8-inch sloping concrete curb for a border. Both through and local traffic are carried on two concrete lanes, 11 and 13 feet wide; passing or faster-moving vehicles take the outer, wider lane.

A safety feature is included which has been all but neglected on many express highways, through routes, and parkways: it is a macadam shoulder directly beside each of the 11-foot concrete strips. On the through lanes the shoulder is 8 feet wide, and on the local lanes it is 10 feet wide.

The shoulder will be a welcome haven for disabled cars, especially in this age when 50 per cent of the vehicles on the roads are 9 to 10 years old. Motorists can park their cars on the shoulder for repairs without the risk of being run down from behind, as often happens when no shoulders are provided. Nor do they have to mount a curb and attempt a tire change on a 1½ to 1 grass slope as is often the case on parkways.

Existing Highway

Back in 1926-1927 the present 9-inch reinforced-concrete pavement was constructed 50 feet wide. Then its four lanes of traffic, two in each direction, were ample for the existing traffic. But not for long. The growth of traffic was phenomenal on this important north-south artery through New Jersey. The highway crosses the meadow marshes, climbs high over the Passaic and Hackensack Rivers on the Pulaski Skyway, and drops down at Jersey City to bore under the North or Hudson River through the Holland Tunnel into New York City.

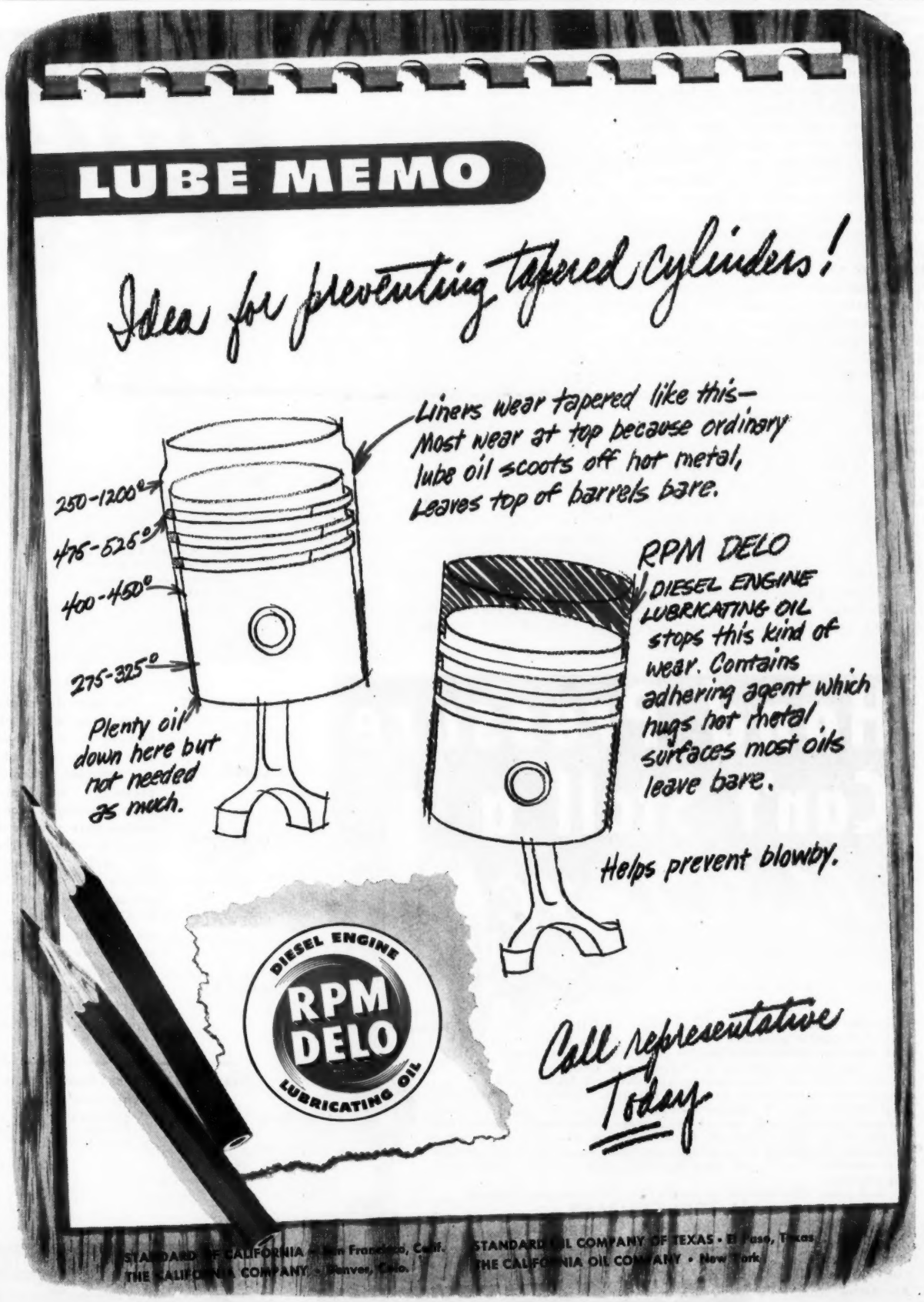
The section now being rebuilt is the worst spot, as far as traffic is concerned, along the entire route. This is caused by the junction of two other heavily traveled highways: U. S. 22 or State Route 29, and State Route 21, which converge on U. S. 1 through an intricate system of interchange structures. These are being augmented by additional bridges in the present work.

During the new construction, traffic had to be maintained on four lanes, as it was impossible to compress the flow of vehicles onto anything less. This was accomplished by building half the new road on one side of the old, then diverting traffic to the four new lanes while

(*Continued on next page*)

C. & E. M. Photo

A Buckeye Finegrader prepares cinder sub-base for concrete paving on the reconstruction of U. S. 1 in New Jersey. It discharges excess material at the right to be bladed away later by a motor grader.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Idea for preventing tapered cylinders!
Liners wear tapered like this—
Most wear at top because ordinary lube oil scoots off hot metal, Leaves top of barrels bare.
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Eight Concrete Lanes Replace 50-Foot Road

(*Continued from preceding page*)

the old pavement was torn up and replaced with the other four new lanes. Contractors removed the existing pavement by shattering the slabs with heavy paving breakers and excavating the cracked rubble with large power shovels.

Five Contracts

From north to south the four paving contracts are as follows: Contract No. 1 for 3,745 feet of pavement was awarded to the Robert W. Cleveland Co. of East Orange, N. J., for $373,391.81 and extends from Port Street to Newark Junction. Contract 2 from Newark Junction to Haynes Avenue includes four grade-separation structures, three at the Routes 21 and 29 intersection and the other at the Haynes Avenue intersection. The work on this 3,500-foot stretch is being done by Poirier & McLane Corp. of New York City for the contract amount of $1,253,626.51; of this sum, $729,304.21 is for the road, and the remaining $524,322.30 is for the bridges and the 91-inch concrete-pipe culvert. The Robert W. Cleveland Co. also secured the 4,500-foot paving section of Contract 3 on its low bid of $542,160.40. This section extends from Haynes Avenue to Carnegie Avenue.

Contract 4 is described here in detail. With 5,589 feet of pavement, it is the longest of the four sections, extending from Carnegie Avenue, Newark, to North Avenue, Elizabeth. The job was awarded to S. J. Groves & Sons Co. of Woodbridge, N. J., on a bid of $994,060.97. Of this, $876,978.90 is for the road and $117,082.07 is for a grade separation at Carnegie Avenue. The bridge construction was subsequently sub-let to the Ell-Dorer Contracting Co. of Irvington, N. J.

The electrical work for lighting the 3.3 miles covering all four contracts is being done by A. Neri of Hoboken, N. J., at a cost of $129,356.83. This includes also the construction of concrete standard bases and the placing of underground cables.

By thus dividing the entire project into sections, better bid prices were obtained and the whole construction

C. & E. M. Photo

A Ransome dual-drum paver discharges a bucket of concrete between Blaw-Knox forms set for a 13-foot lane, on the Groves contract to widen U. S. 1 in New Jersey.

was expedited. Work started last spring on the improvement, and by late autumn most of the pavement was completed. But the project will not be completely effective as far as relieving traffic congestion until this year when the grade separations are finished. Even then, the speedy movement of traffic on this highway will not be fully realized; for at either end of this improvement the existing road can carry only four lanes of traffic.

No permanent relief in traffic congestion can be expected until the much discussed Route 100 is constructed. This highway would start at the New Jersey end of the George Washington Bridge over the Hudson, and continue down into Middlesex County, thereby taking some of the traffic burden off this most heavily traveled artery. The proposed path of Route 100 lies to the east of Route 25 but west of the Central Railroad of N. J. right-of-way, out on the meadows bordering Newark Bay. Contract 4 includes short spurs branching off to tie into the suggested route at some future date.

Grading

The entire length of the project is built on a fill that was made five years ago after first removing meadow grass and swamp sod. While the fill is only a few feet high, the long period which has elapsed between making the embankment and laying the pavement is expected to eliminate the danger of settlement on the marshy flats. Naturally some grading had to be done on top of the embankment, but the average was only 1 to 2 feet either of cut or fill. On the S. J. Groves & Sons Co. contract, the top of the fill was leveled with four 12-yard Tournapulls and two LeTourneau 12-yard scrapers pulled by D8's.

During these early operations the fi buildings of the Elizabeth Home for I digents had to be demolished and the occupants distributed among priva homes throughout the city. Demolitio of buildings was carried out under separate contract awarded to Cosm Wrecking Co. of North Bergen, N. The City of Elizabeth also installed 60-inch sewer and a 16-inch water ma for possible future connections. And various public utilities—water, ga electric, and telephone—were busy pu ting in their conduits, poles, and pip to serve the communities of Newa and Elizabeth.

The design of the new road called f a layer of porous sub-base materi from 12 to 16 inches thick under t pavement and shoulders. On Contrac 1 and 3 the contractor used grav dredged from Newark Bay for this pu pose; sand was employed on Contra 2 as a sub-base; on the Groves contrac Number 4, cinders were spread an then rolled over the subgrade. The cin

(*Continued on next page*)

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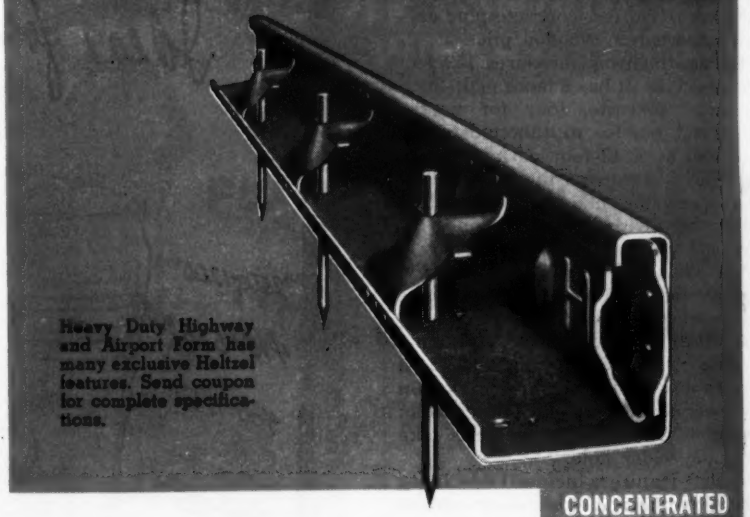

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Heltzel also has steel forms for curb, combined curb and gutter, sidewalk, rigid radius and flexible radius.

Heltzel Steel Form & Iron Company, Warren, Ohio

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FINISHING TOOLS FOR CONCRETE ROADS

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Hand Pressure Can't Stall a MallDrill

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On the toughest drilling jobs, MallDrills will not stall under pressure . . . heat up under load . . . nor require lubrication under continuous use. Any servicing of commutator or changing of brushes can be done without dismantling the drill. A husky 3-jaw geared chuck holds the drill bit firm—preventing slipping and chattering. A trigger switch releases more than enough torque to drill wood, metal or plastics. Nationally advertised in the May 10th issue of *The Saturday Evening Post*—the powerful MallDrill is available at your local Mall Dealer in five models: 1/4" (in two speeds), 3/8", 5/16" and 1/2" capacities.

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MALL TOOL COMPANY
7743 South Chicago Ave., Chicago 19, Ill.

★25 Years of "Better Tools For Better Work"

Mall PORTABLE POWER TOOLS

C. & E. M. Photo
On this transverse joint, the dowels on the left or paver side fit into round expansion sleeves coated inside and out with tar paint.

Eight Concrete Lanes Replace 50-Foot Road

(Continued from preceding page)

ders were obtained from the power plant of the Public Service Corp. at Kearny, N. J. They were hauled 5 miles to the job by the trucking firm of Keegan & Nolan of Kearny.

An average of eight trucks, paid for cinders compacted in place, did the hauling. These cinders were required to be hard, clean, vitreous clinker from soft coal. They had to weigh not less than 42 pounds per cubic foot, laboratory dry loose weight. They had to pass a 4-inch sieve; furthermore not more than 55 per cent by weight was to pass a ¼-inch screen and no more than 38 per cent by weight was to pass a No. 10 mesh screen.

After the trucks dumped the cinders, two Caterpillar No. 12 power graders spread them. Rolling was done by any of five 10 to 12-ton 3-wheel rollers on the job, including two Hubers, two Austin-Westerns, and a Buffalo-Springfield. The spreading and rolling was done in two lifts.

Preparations for Paving

There were 5,000 feet of Blaw-Knox forms on the job. These were set on the rolled cinders for 800 to 900 feet in front of the paver, except of course around the approaches to the grade-separation structure or the curving tie-ins for Route 100. As this was the first construction season since the end of the war, S. J. Groves & Sons Co., like most contractors, had to start with a green concreting crew. To break them in, or rather to refresh their skills, the first concreting was done on short approaches. This was particularly beneficial to the grading crews and form setters on whom the speed of the rest of the job depended. No speed records were set. But they weren't expected, because of the heavy traffic, the fairly short overall length of the job, and the shifting of the paver from lane to lane, together with the simultaneous construction of curbing.

After the forms were set for either the 13 or 11-foot lanes, a Buckeye Finegrader moved forward over the subgrade, advancing by means of cables fastened to the forms ahead. Excess material was thrown off to one side and later bladed away by the grader. Then the cinders were rolled again, this time with a Buffalo-Springfield 3-wheel 5-ton roller which pulled along a steel template running on four wheels, two on each side. This contractor-made template had adjustable blades for any width or depth and assured the full 10-inch depth being obtained over the whole slab. The forms were then oiled with fuel oil applied by a spraying machine.

Road Joints

Where one lane of concrete runs alongside another, they are bonded together with a key. This was made by fastening a steel strip ½ inch wide x 2 inches deep longitudinally along the form at half the depth, and holding it in place by bolts set on 12-inch centers.

The transverse joints are beam-type expansion joints set 56 feet 4 inches on centers. They consist of a single piece of cork filler, ¾ x 9 inches, and they are set so that the top of the joint is 1 inch below the top of the slab. At the mid-depth point of the slab the cork was pierced with a row of holes set on 12-inch centers to accommodate 1-inch round dowels 17 11/16 inches long. The dowels were supported at the ends by a pair of 2-inch channels which in turn rested on angle irons placed opposite each other bearing against the steel road forms. These angle brackets were part of a clamp assembly that extended under the form to the outside where it was secured. Later when the forms

(Continued on next page)

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Sturdy, heavy-duty rollers, engineered to stand up under the toughest conditions. Pierce-Bear Tandem Rollers are powered by economical Allis-Chalmers 4-cylinder industrial type gasoline engines. Variable weights, from 3½ to 5 tons with built-in water tanks for ballast and wet rolling.

Pierce Baby Bear 2½-3 tons

Pierce Medium Bear 3½-5 tons

The new 2½-3-ton Pierce Baby Bear is designed for close-in work and small area maintenance. It works against a curb up to 25 inches high and within 1½ inches of a higher wall or building. Final drive is within the rear roll. Use Pierce-Bear Tandem Rollers for all-around performance. Write for folder.

Pierce-Bear Rollers

Lewis Manufacturing Company

415 Hoefgen Avenue—San Antonio 6, Texas

FOR THE BRAND NEW ALLIS CHALMERS HD-5 TRACTOR

Specially Designed and Balanced Equipment by

When it comes to *real*, down to earth *engineering* in small packages . . . you just can't beat the brand new, *specially* designed and balanced Gar Wood Equipment for the new Allis Chalmers HD-5 Tractor.

For here is a combination that's engineered and built expressly for *years* of dependable, rugged, smooth-functioning *work*. Perfectly-balanced earth-moving *brawn* that means more profit to you! And what's more . . . it's a combination that's *built to take a beating* . . . under the *worst* possible conditions . . . on the toughest jobs!

Want proof? Ask the men who've been using Gar Wood Road Building Equipment all over the world. Ask *them* about

GarWood

Gar Wood quality and dependable operation *when and where it counts*. Then consider: this is newly designed, exactly-engineered, quality-built Gar Wood Equipment.

And then . . . for your own good . . . specify Gar Wood!

GAR WOOD GW TRADE MARK INDUSTRIES

ROAD MACHINERY DIVISION
WAYNE, MICHIGAN

Eight Concrete Lanes Replace 50-Foot Road

(*Continued from preceding page*)

were removed the clamps were also detached for use elsewhere. When the second lane was being paved, the channels were held in place alongside the previously poured slab by means of a composition bracket of bituminous material which was left in the concrete.

On the side towards the paver, the dowels slide in round sleeves that have been coated inside and out with tar paint. The ends of the dowels bear against 1-inch cork plugs inserted in the circular sleeve to take care of the movement as the slabs contract and expand. The cork joint was held in place to form a straight line across the slab by backing it up with a steel plate on one side, and by having a 1-inch lip over the top of the cork on the other. The plate had notches cut in it to accommodate the dowels.

Six steel pins were driven in the ground alongside the plate to prevent its shifting as the concrete was placed. Another pin was driven at the center point of the channel supports to check any movement there. Once the concrete had been dumped around the joints the pins were removed. For transverse joints at slabs of odd widths, a tongue-and-groove joint was used. All joints were made by Igoe Bros. of Newark.

Paving With Concrete

Batches of sand and stone for the pavement were purchased from Loizeaux Builders Supply Co. which has a batch plant at Elizabeth, about a 2-mile average haul from the job. Both fine and coarse aggregate were brought to the waterfront plant on barges. The sand was purchased from the Henry Steers Corp. of Northport, L. I., N. Y., and the stone came from the New York Trap Rock Co. at Haverstraw, N. Y.

The contractor set up his own Blaw-Knox 300-barrel bulk-cement bin at the batch plant. And after the batch trucks had received their loads of sand and stone, the cement was dumped into metal waterproof containers. These were set up over each batch in the truck so that all the materials dumped together into the paver skip. The air-entraining cement was purchased in bulk and arrived by rail in bulk-cement cars from Penn Dixie and Lehigh Portland Cement Cos.

The batch hauling was sublet to J. W. Embley of Keansburg, N. J., on a batch-payment basis. An average of 14 trucks of various makes, each holding 2′ batches, were used in the hauling. The weight of a typical 9-bag batch with the moisture included in the aggregate was as follows:

Cement	846 lbs.
Sand	1,463 lbs.
1½-inch stone	1,546 lbs.
¾-inch stone	1,544 lbs.
	5,399 lbs.

This 1:1.71:3.5 mix of Class B concrete required 6.7 bags of cement for 1 cubic yard. Or, expressed another way, it required 1.861 bags for 1 square yard of 10-inch pavement. For each bag of cement 4.4 gallons of water was used (including moisture in the aggregates). The gradation of the sand and the two kinds of stone, each making up 50 per cent of the coarse aggregate, was as follows:

	Per Cent Passing		
Sieve Size	1½-inch stone	¾-inch stone	Sand
2½-inch	100	.....	.....
1½-inch	10-30	100	.....
¾-inch	0-5	45-75	.....
½-inch	.....	25-45	.....
⅜-inch	.....	.....	0-5
¾-inch	0-2	0-10	.....
No. 4	.....	.....	5-20
No. 10	.....	0-2	20-60
No. 30	.....	.....	20-50
No. 50	.....	.....	12-25
No. 200	.....	.....	0-5

Before the concrete was placed, the subgrade was given a final smoothing with a 300-pound hand roller pulled up and down between the joints. The cinders were wet down with a hose hooked up to the Ransome 34-E dual-drum paver. Mixing time was 1¾ minutes for both drums. Water for the mix was obtained from the Elizabeth water mains and distributed over the entire contract through about a mile of 2-inch steel pipe. Every 400 feet a tee connection was inserted in the pipe. The water was brought from these outlets to the paver through 350 feet of 2-inch hose.

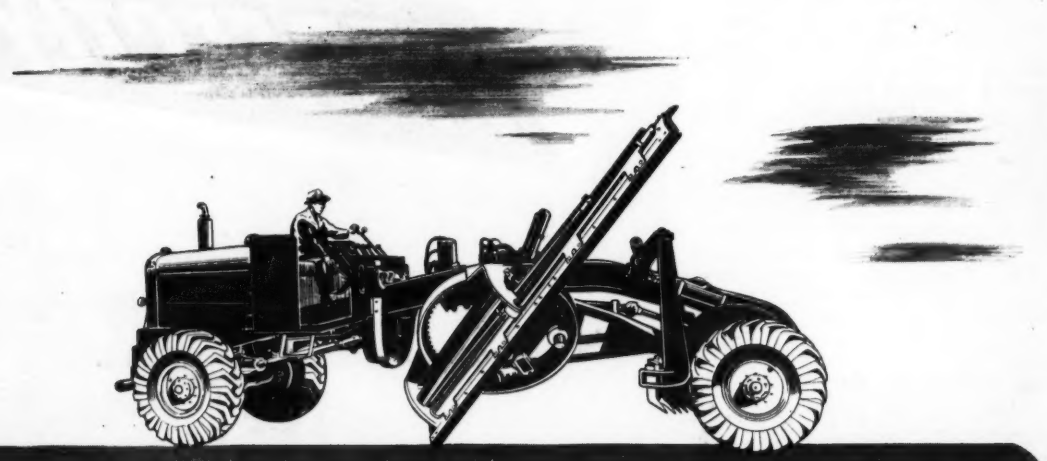
The 38-foot boom on the paver permitted easy spotting of the concrete on the subgrade, as the paver worked alongside the forms with the trucks backing up to it. Four puddlers kept the concrete low so that the steel-mesh reinforcing could be placed 2 inches below the top of the slab. The mesh was made of ⅜-inch deformed rods tied together in 7½ x 27-inch rectangles. It was supplied by the Bethlehem Steel Co. from Elizabeth and delivered to the job after a 2-mile average haul. Before reinforcement was placed, the concrete was vibrated along the forms and at the joints with a Master vibrator; then the two steel handlers tamped the concrete to the proper depth with a hand screed built for this purpose. The mesh was then set in place and tamped to bed in place by the screed. Afterwards it was covered by concrete.

Finishing and Curing

The concrete was then brought level with the forms by means of a Blaw-Knox finishing machine which usually made two passes over the pour to insure a smooth surface. The finishers kept enough concrete in front of the mechanical screed to prevent any low spots developing. After the finishing machine passed over the concrete a longitudinal finish was given the pour with a bullfloat; this consisted of a 2 x 6

(*Continued on next page*)

All-Wheel Drive and Steer • High Lift Blade • Extreme Reach • Completely Reversible Blade



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FOR ALL-WHEEL DRIVE AND ALL-WHEEL STEER

in a motor grader . . . no way in which any rear drive, front steer machine can equal the maneuverability, power-at-the-blade and all-around performance of the 99-H Power Grader.

Get the complete story of the many additional features of the 99-H from your A-W distributor, or send for the latest bulletin.

AUSTIN-WESTERN COMPANY, AURORA, ILLINOIS, U. S. A.

Austin Western

Eight Concrete Lanes Replace 50-Foot Road

(*Continued from preceding page*)

at the end of a 14-foot handle which could reach across the wide lane. The surface was then checked carefully with a long-handled 10-foot aluminum straight-edge. The finishers worked from their bridge across the pavement and floated around the joints. They followed this by dragging a 2-foot strip of burlap lengthwise along the surface to remove excess water.

About 15 minutes after the concrete had been placed, the finishers loosened the bond between the steel plate backing up the cork joint and the fresh concrete, and removed the plate. Then they re-covered the top of the cork with a steel channel strip having 2-inch lips on each side; a 1-inch strip of wood was inserted in this metal cover so that the top would be flush with the top of the pavement. A light fiber broom was then pulled transversely across the slabs to give them a broom finish. Afterwards the joints and sides of the pavement were edged with a ¼-inch-radius edging tool. Before the concrete had taken its final set, the steel channel strips were removed from the joints.

The concrete was cured by spraying TMC colorless curing compound through a 15-foot spray bar hooked up with a Thompson Materials Corp. portable spraying machine. A day or two after the pour the joints were poured with BM-2 heated in a Littleford pot mounted on a 2-rubber-tired wheel chassis.

Each slab was given a number and this number was impressed in the concrete with a metal stamp. The last slab each day had the date as well as the number. In this way an accurate check was kept of the date that particular slab was poured so that it could be opened to traffic at the proper time but not before. From May 16 to October 15 the concrete cured for 9 days before traffic was permitted. A longer curing period of 12 days was required between October 16 and May 15. In order to measure the expansion and contraction of the slabs, particularly around the joints, two brass plugs were inserted in the pavement on each side of the joint at a number of locations. Thus the difference in distance between them can be noted either in cold or hot weather and the precise amount of expansion can be determined.

After a period of not less than 12 hours, the forms were removed and hauled up to a new location for setting. No paving records were sought or expected while working in this tight location with traffic a constant hazard. But the crew averaged around 1,000 square yards of pavement in a 9-hour day, or from 800 to 900 linear feet of single lane either 11 or 13-foot width.

Durable Shoulders

The 8 and 10-foot shoulders are of durable construction 8 inches thick; they consist of a 4-inch stone base course of 2½-inch stone. This course was rolled and choked with Grade B screenings and then covered with an intermediate course of 3-inch modified penetration macadam made up of 1½-inch stone. After rolling the intermediate course received a penetration coat of RT-11 tar applied at the rate of 1.65 to 1.75 gallons to the square yard. Enough ⅝-inch stone was then spread over the tar to fill all surface voids and to form a thin mat.

C. & E. M. Photo

A Blaw-Knox finishing machine starts the second pass over a concrete pour for a new section on heavily traveled U. S. 1. Finishers have scattered some concrete over a low spot for the machine to level off.

This stone was well rolled. Next, a 1-inch bituminous-concrete surface course of Type T plant-mix was laid cold—that is, between 35 and 125 degrees F—with a mechanical spreader. The mix consisted of ⅜-inch stone coated with RT-10 tar. This same type of construction was required for any temporary detours to keep traffic moving during the shifting from the old to the new pavement.

On this contract the northbound through and local lanes were completed by Labor Day. After that date, traffic was switched over to the new road and the old pavement was then torn up. A subcontract was let for the pavement breaking and the old concrete was removed by a Northwest 1¾-yard shovel. The rubble was used in the fills on the grade-separation approaches.

The crown in the new pavement is at the line of the two slabs. There is a 2-inch fall to the curb across the 13-foot slabs and a 3½ and 4-inch fall to the curb across the 11-foot lanes and the 8 and 10-foot shoulders respectively.

(*Concluded on next page, Col. 2*)

LANSING

WHEELBARROWS

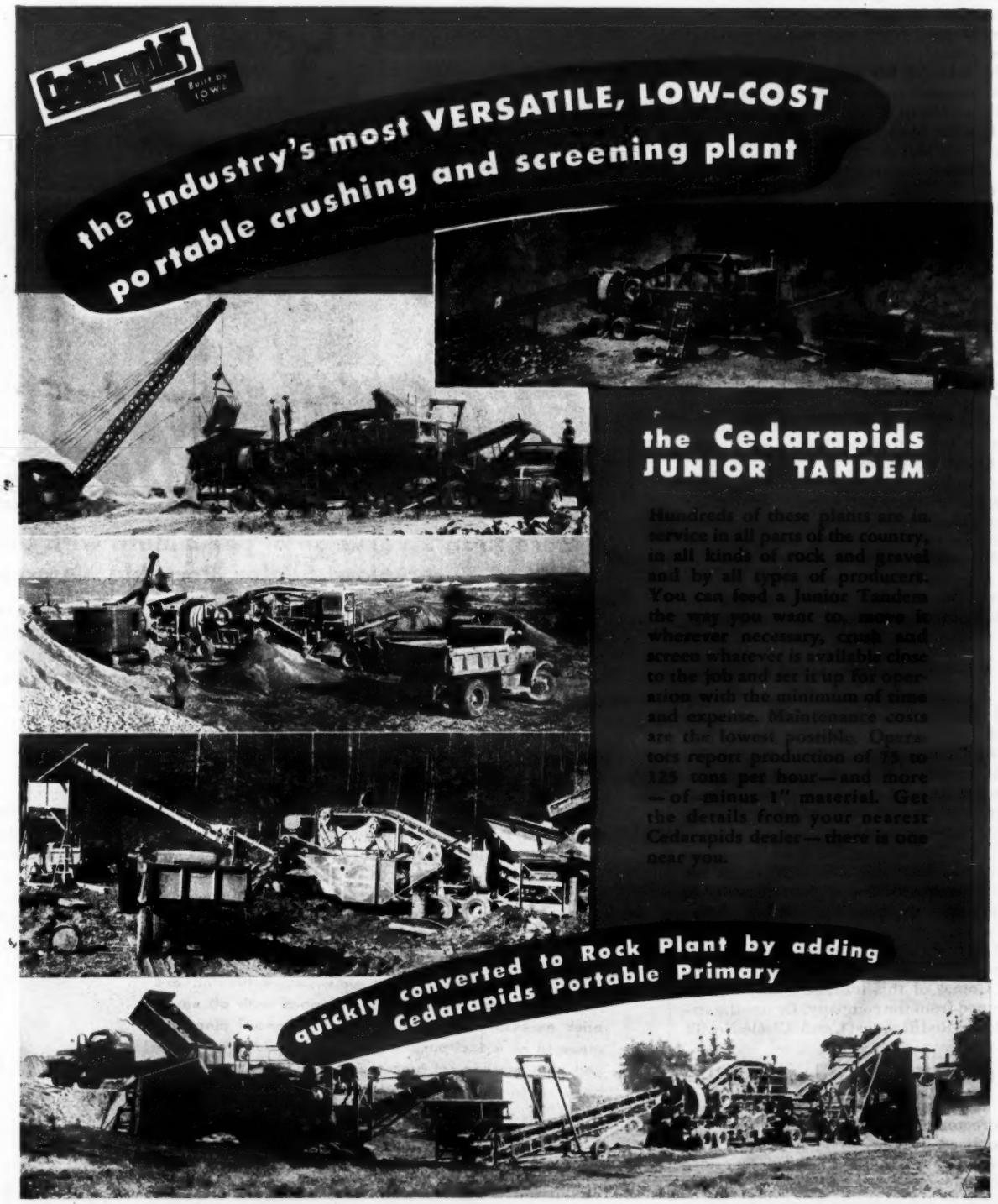
CONCRETE MIXERS

DRAG SCRAPERS

Lansing Company

LANSING, MICH.

SINCE 1861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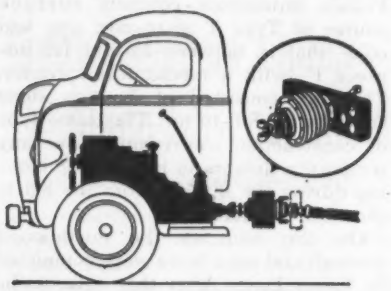
the Cedarapids JUNIOR TANDEM
Hundreds of these plants are in service in all parts of the country, in all kinds of rock and gravel and by all types of producers. You can feed a Junior Tandem the way you want to, move it wherever necessary, crush and screen whatever is available close to the job and set it up for operation with the minimum of time and expense. Maintenance costs are the lowest possible. Operators report production of 75 to 125 tons per hour—and more—of minus 1" material. Get the details from your nearest Cedarapids dealer—there is one near you.
quickly converted to Rock Plant by adding Cedarapids Portable Primary

THE IOWA LINE *of Material Handling Equipment Includes*

ROCK AND GRAVEL CRUSHERS • BELT CONVEYORS—STEEL BINS • BUCKET ELEVATORS • VIBRATOR AND REVOLVING SCREENS • STRAIGHT LINE ROCK AND GRAVEL PLANTS • FEEDERS—TRAPS • PORTABLE POWER CONVEYORS • PORTABLE STONE PLANTS • PORTABLE GRAVEL PLANTS • REDUCTION CRUSHERS • BATCH TYPE ASPHALT PLANTS • TRAVELING (ROAD MIX) PLANTS • DRAG SCRAPPER TANKS • WASHING PLANTS • TRACTOR-CRUSHER PLANTS • STEEL TRUCKS AND TRAILERS • KUBIT IMPACT BREAKERS

Iowa Manufacturing Company, Cedar Rapids, Iowa, U. S. A.



The new Couse power take-off, shown here, operates small tools, lathes, and similar equipment on the job.

Power Take-Off Unit

A power take-off designed to fit between a truck transmission and transfer case is made by Couse Mfg., Inc., 300 Passaic St., Newark 4, N. J. By means of such a take-off, it is possible to eliminate an extra engine on the job for running small tools, lathes, drill presses, pumps, generators, and welding units, to mention a few applications.

The Couse power take-off uses a flexible-coupling type of design. The flexible drive shaft has a standard universal-joint front end, and a universal gear-coupling inside-pulley rear end. The take-off has a free-shifting collar, and the shifting fork makes contact only at the time of shifting. It will function while the truck is in motion. All moving parts run in a bath of oil.

Further information may be secured from the company, or by using the enclosed Request Card. Circle No. 51.

Kit for Snake Bites

Treatment for snake bites in the field is provided by a first-aid snake-bite kit made by Mine Safety Appliances Co., Braddock, Thomas, and Meade Sts., Pittsburgh 8, Pa. It is a lightweight plastic kit slightly larger than a pack of cigarettes, and it can be carried in a vest pocket. With it, the manufacturer says, treatment can be applied without assistance.

The kit contains a tourniquet, antiseptic brush, incising knife with a ¼-inch blade, self-suction pump, adapters for the pump, ammonia inhalants, and adhesive compress dressings.

Further information may be secured from the company or by using the enclosed Request Card. Circle No. 11.

Unusual Jack Uses Listed

A recently released catalog on its line of hand jacks up to 100-ton capacity is now available from the Blackhawk Mfg. Co., Catalog Dept., 5535 W. Rogers St., Milwaukee 1, Wis. In addition to jack-model listings, it tells of some unusual applications and services not ordinarily associated with jacks.

Page 3 of catalog No. J-46 lists seven features that the company claims for the Blackhawk line. The remainder of the announcement is devoted to photographs, descriptions, and specifications of its complete line, which includes gage jacks and wheeled floor jacks.

Copies of this literature may be obtained from the company. Or use the enclosed Red Request Card. Circle No. 89.

Gar Wood Advances Hill

The appointment of E. B. Hill as Director of Factory Sales has been announced by Gar Wood Industries, Inc. In his new post Mr. Hill will supervise all factory sales activities, including those of the company's Buckeye Traction Ditcher and St. Paul Hydraulic Hoist Divisions.

Other appointments were announced at the same time: Nick Etten to the Chicago branch as assistant to the manager; Ben C. Helm to the staff of the Vice President in charge of sales; and William H. Lingner to the position of Assistant Manager of the San Francisco branch.

Eight Concrete Lanes Replace 50-Foot Road

(*Continued from preceding page*)

Catch basins at frequent intervals along the curbs will take care of storm water. Two-inch conduits are laid at various locations under the pavement to carry cables to light poles, 25 feet high; these are spaced about 175 feet apart and overhang the pavement from 12 to 15 feet out from the curb.

Personnel and Quantities

A force of about 120 men was employed on this contract with an average of 20 on the grading, 20 on drainage, 60 on paving, and the rest supervisory and clerical. The major items in the roadway contract included:

Roadway excavation, earth	58,109 cu. yds.
Sub-base material	24,953 cu. yds.
Topsoil, 4 and 6-inch	95,157 sq. yds.
Macadam base course, 4-inch	14,088 sq. yds.
Macadam intermediate course, 3-inch	14,088 sq. yds.
Reinforced-concrete pavement, 10-inch	71,885 sq. yds.
Reinforced-concrete pipe, 12 to 36-inch	5,301 lin. ft.
Cast-iron pipe, 12 to 36-inch	1,705 lin. ft.
Curbing, various sizes	42,205 lin. ft.

The S. J. Groves & Sons Co. was represented on the project by John Mathews, Project Manager; W. H. Fordham, Engineer; and Joseph Vallone, General Foreman. For the New Jersey Highway Department, which is headed by Spencer Miller, Jr., Commissioner, Charles M. Noble is the State Highway Engineer and R. M. Beck is the Northern District Engineer in charge of all construction projects in the northern part of the state. Maurice Radus was the Resident Engineer in charge of Contract 4.

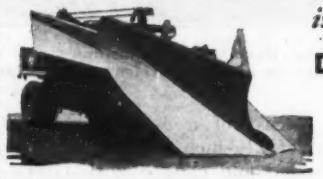
Sales Manager for Marion

The appointment of M. V. Cornell as Sales Manager of Marion Power Shovel Co., Marion, Ohio, has been announced by the company. He succeeds Walter N. Westland who recently resigned.

BRILLIANT PERFORMANCE EVERY TRIP OUT

is Assured by

DAVENPORT - FRINK SNO-PLOWS



ALL TYPES AND SIZES

PLAN NOW for NEXT WINTER. No matter what the snow or ice conditions, you obtain FASTER • SAFER • CLEANER snow removal with the lighter, yet stronger DAVENPORT-FRINK SNO-PLOWS. Available in "V" and Straight Blade types for all sizes of trucks, tractors, road patrols and locomotives. Be ready. Buy early. Write us for complete information.

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Made in Eastern U.S.A. by CARL H. FRINK. 1000 Islands, CLAYTON, NEW YORK

A ROCK-EATER

Says BILL REES, Monroe, Wisconsin

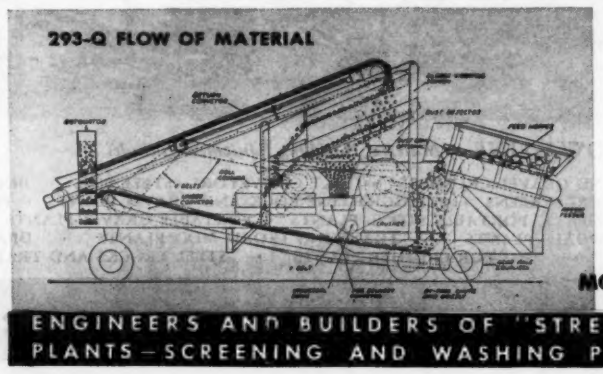
More than 2 yards of ¾" per minute with Universal 293-Q Pacemaker Senior Portable Quarry Plant

"In my opinion, the Universal 293-Q Pacemaker is the finest portable rock plant built. It consistently produces 125 yards of ¾" material per hour from rock with a wearing test of 41.3. It can be moved from the quarry for dynamite shots and be back in operation in 22 minutes. On one occasion we moved the entire plant 28 miles and were set up and crushing to capacity in 4 hours. We have produced over 300,000 tons with no expense other than normal operation and maintenance costs which have been unusually low."

"Stream-Flo" Engineering and Twin-Dual Rolls Provide Amazing Capacity at Low Cost Per Ton

Featuring three stages of reduction with only two crushers, the 293-Q Pacemaker shovel-loads direct from quarry, increasing profits by eliminating the expense of quarry trucks and costly ramps. Once you start feeding rock into its sturdy shovel-loading hopper, material flows in a steady stream to save time and cut operating costs. The complete plant consists of a jaw crusher, Twin-Dual roll crusher, 2½-deck gyrating screen, apron feeder, bar grizzly and by-pass, under conveyor, Rotovator, and return conveyor. These units, combined with all auxiliaries necessary in a smooth, well-balanced plant, are mounted on a dual pneumatic tired gooseneck truck equipped with mechanical brakes and rear wheel equalizers.

For capacity to tackle largest jobs, for portability to handle small contracts profitably, investigate the Universal 293-Q Pacemaker now. Learn how "Stream-Flo" Engineering gives you higher capacity, ready portability, and lower costs per ton. Your nearby Universal distributor has the facts or write for full information.



WRITE FOR BULLETIN No. 31

UNIVERSAL

ENGINEERING CORPORATION

620 C Avenue, N.W., Cedar Rapids, Iowa

MORE TONS PER HOUR—LESS COST PER TON

ENGINEERS AND BUILDERS OF "STREAM-FLO" ROCK, GRAVEL, AND LIME PLANTS—SCREENING AND WASHING PLANTS—CONVEYORS—APRON FEEDERS

Avoid Legal Pitfalls

Edited by A. L. H. STREET, Attorney-at-Law

These brief abstracts of court decisions may aid you. Local ordinances or state laws may alter conditions in your community. If in doubt consult your own attorney.

Compensation Rights of Discharged Construction Manager Are Defined

The contractors on a Federal construction project discharged a manager while work was in progress. He was, however, entitled to receive one-fourth of the net profits. How, therefore, should his recoverable compensation be measured? What latitude was permitted by a contract provision that he might be discharged for dissatisfaction with his services? On a court determination that he was justly discharged, but was entitled to limited compensation, who should bear the court costs?

These questions were recently answered as follows by the Arkansas Supreme Court (Rife et al., appellants-defendants, v. Mote, appellee-plaintiff, 197 S. W. 2d, 277):

(1) If he had been wrongfully discharged, the manager would have been entitled to one-fourth of the net profits of the job. But there was no reason to doubt that he had been discharged for bona fide dissatisfaction with his services. Therefore he was entitled, under the wording of his employment contract, to only a percentage of the net profits. And that percentage should be based on the managerial work done before his discharge, as distinguished from the construction work completed during that time.

(2) The contract provision permitting discharge for dissatisfaction with his services justified a discharge if the contractors acted honestly and in good faith. It was immaterial whether or not others might deem that ground for dissatisfaction existed.

(3) Under the circumstances, which will be detailed later, all unpaid court costs should be assessed against defendant-contractors.

Contract Clauses

The essential clauses of the employment contract provided that the manager should receive "as compensation for his management services, 25 per cent of the net profits which may accrue on this project, as computed at the close of the project, but subject to any change in contract price which may be made by the Government as the result of the renegotiation clause in the contract"; that the contractors might remove the manager any time, subject to his right to compensation for "the value of the services . . . rendered . . . to that date, . . . based on the percentage of work which has been accomplished to the date of cancellation of this contract"; and that the employment could be terminated by one of the contractors any time "should he become dissatisfied in any manner with the services being rendered by" the manager.

Discharge in Good Faith

The Arkansas court followed a well established rule of law concerning discharge. Under a contract so worded, "while it is not essential to the existence of right to discharge . . . that the employer have any real or substantial ground for dissatisfaction, yet he must act honestly and in good faith. His dissatisfaction . . . must be real and not pretended; it must not be capricious or mercenary, or the result of a dishonest design to be dissatisfied in any event. If he feigns dissatisfaction and dismisses the employee, the discharge is wrongful". A jury "cannot inquire into the reasonableness of such dissatisfaction, provided it is genuine and not set up in bad faith merely to conceal some other insufficient excuse".

In deciding that the contractors acted in good faith in dismissing plaintiff, the Arkansas Supreme Court pointed to certain evidence. Other key men on the job and Government engineers had adversely criticised plaintiff's work. Also, he had failed to comply with a request that he report to the contractors' home office to discuss claims of mismanagement.

The court ruled that acts of mismanagement committed by him before the contract was signed—nearly a month after his employment really commenced—would not, in themselves, justify a discharge. But they could be considered in the light of subsequent mismanagement.

Computing Compensation

The amount to which the manager was entitled, as pay for services rendered up to the time of his justifiable discharge, was hard to determine. Figuring was complicated by the employment-contract provision that, in such case, he should be paid the value of services rendered by him, "based upon the percentage of work . . . accomplished".

Proof showed that only 5.8 per cent of the construction work had been completed at the time of discharge. So the contractors insisted that all the manager was entitled to was 25 per cent of the net profits on that portion of the contract job. But the court decided that "the percentage of the work 'accomplished' on the date of discharge means the percentage of *managerial work* accomplished". It pointed out that the percentage of *construction work* completed at a given time would not necessarily reflect the extent of managerial services rendered during that period.

The court approved a formula under which the managerial services were broken down into these principal elements: "(1) Laying out the operation; (2) perfecting the organization; (3) awarding contracts and subcontracts for materials and jobs; and (4) job management." The first three items of service had been virtually completed before the discharge. (Any reader who is especially interested in knowing just how a referee, whose computation was approved, found that the manager was entitled to 8.13125 per cent of the entire profits on the job, can do so by gaining access to a copy of the court's opinion and reading a complicated footnote to page 283.)

The court also decided, in favor of the manager, that the contractors were not entitled, in computing net profits of the job, to include as part of office payroll expense bonuses that had been paid to two office employees several months after the discharge date.

Assessing Court Costs

The contractors had denied owing the manager anything, and relied upon an unsubstantiated counterclaim for damages on the ground of mismanagement—thereby compelling him to sue. Therefore, the court ruled, it was only just that the court costs should be assessed against the contractors, excepting as certain costs had been paid equally by agreement of the parties.

Case Sidelights

As previously noted, the employment contract provided that the net profits of the job, in which the manager was to share, should be "computed at the close of the project, but subject to any *change in the contract price* which may be made by the Government as the result of the renegotiation clause in the" construction contract. This provision was not in dispute in the case. But, in passing, it is interesting to note this: the parties treated any potential "renegotiation" of the contract by the Government under a Federal law (that is, recapture by the Government of part of the construction-contract profits as being excessive profits) as amounting to a change in the contract price.

Litigation is now pending in at least one Federal court—in Minnesota—on this question of computing net profits in which a superintendent is entitled to share. Is he

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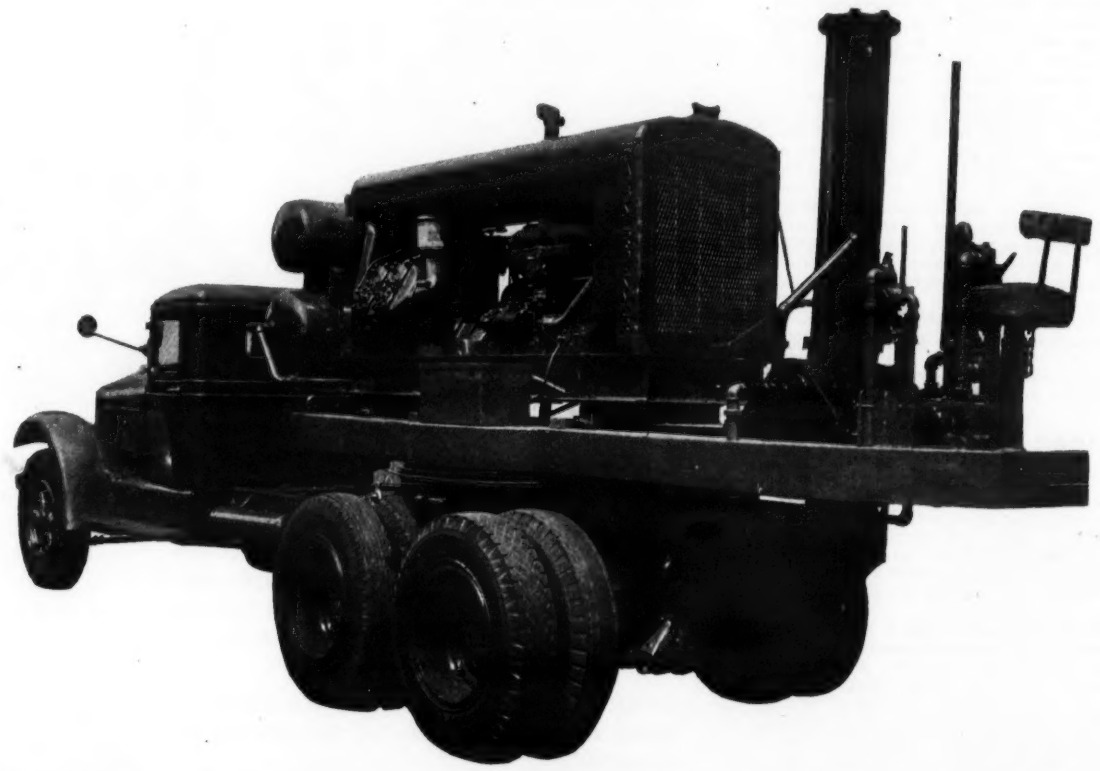

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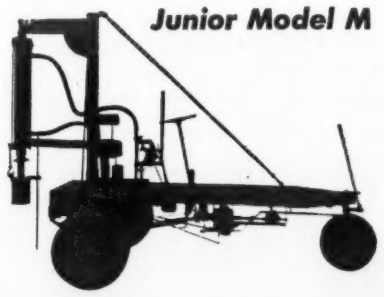

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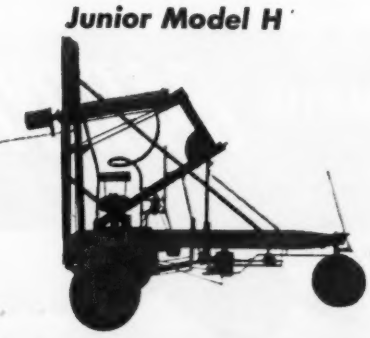

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Avoid Legal Pitfalls

(*Continued from preceding page*)

entitled to share in job net profits as shown by an amount the Government pays to the contractor on completion of the job? Or is the computation to be made upon the contractor's *actual* net profit, after deducting such sum as may be *recaptured* by the Government in renegotiation proceedings. The results of such litigation will be reported as promptly as possible in this department of CONTRACTORS AND ENGINEERS MONTHLY.

Government Not Blamable When Strike Delayed Job

The United States terminated a partly finished construction job. It relet the uncompleted work to plaintiff. Some of the employees of plaintiff's subcontractor struck until the original subcontractor was paid what was coming to him from the original contractor. This delayed completion of the job. So plaintiff claimed damages from the Government on account of job and office overhead expense resulting from the delay. Dismissing the claim, the United States Court of Claims said (Holton v. United States, 65 Fed. Supp. 903):

"Defendant [the Government] made no representations to plaintiff that bound it to respond in damages in the event of a situation such as developed between plaintiff and his laborers because of the failure of the prior contractor to pay his subcontractor fully for work performed on the building for such prior contractor. Neither was the defendant guilty of any concealment from plaintiff of any information which it had and which it was its duty to disclose to plaintiff. Plaintiff was given the names of all prior subcontractors and advised of the nature of the work which they had performed. The Government's refusal to pay the unsatisfied claim of Chouinard [the prior subcontractor] against the prior contractor, so as to prevent a strike by plaintiff's workmen, was not a breach of its contract with plaintiff."

Damages: Rented Tractors Kept Beyond Contract

An owner of tractors rented them to grading contractors for use on a Government job. The rental contract was terminable at the option of the contractors, but they were bound to return the equipment to the point whence it had been shipped, or to some other point not more distant.

The contractors gave a day's notice that the contract would be terminated and asked shipping instructions. But the equipment was detained, on orders of the Government, as long as the contractors should use substitute tractors leased from it at a lower rental. Later the original lessor sued the contractors and their surety to collect rentals or damages for detention of the equipment. Disposing of the case on appeal, the United States Circuit Court of Appeals, Fifth Circuit, decided:

The contractors were not relieved from obligation to pay the lessor rent or damages while the equipment was detained. "Lessor's equipment was not frozen by the Government but by the act of the contractors in 'freezing on to' the equipment rented from the Government at less cost, thereby making the so-called 'freezing order' applicable to lessor's tractors."

If, after the contractors gave notice that they were terminating the lease, they used the equipment, that might be regarded as such withdrawal of the termination as to render them liable for rent. But even if the contract was unquestionably terminated, the contractors would still be liable in damages under the circumstances above stated. However, damages for retention of equipment without using it should not equal a rental for use, because rental value generally takes into account the wear and tear resulting from use. (United States v. Maryland Casualty Co., 146 Fed. 2d, 379.)

On the last point stated, it is interesting to note another case, decided by the United States Circuit Court of Appeals, Second Circuit (United States v. Zara Contracting Co., 146 Fed. 2d, 606). In this, a contractor used a subcontractor's equipment after terminating the subcontract. It was decided that in determining *rental value* to which the subcontractor was entitled, the general contractor was liable for the time of retention and not merely for the hours of use.

But it will be noted that there the circumstances were such as to imply that the retention of the equipment was not wrongful, and that the owner was entitled to a rental regardless of use; whereas in the first cited case, the court treated the situation as being one in which the detention was wrongful, thereby calling for an assessment of *damages*. However, the damages obviously would not be as great where there was no use of the equipment as if there had been use and consequent wear and tear.

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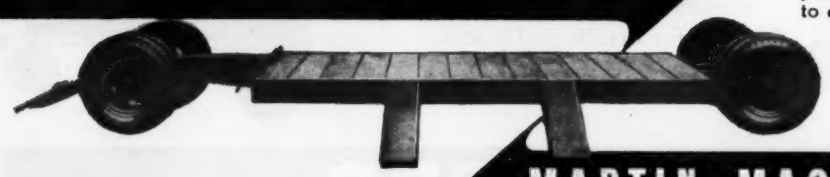

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Contractors & Engineers Monthly

Detailed Rock Study At Hungry Horse Dam

Geological Background Is Probed by Government Experts as Plans Take Form for Concrete Dam

✦ A NEW multimillion-dollar concrete dam is destined soon to rise several hundred feet above the swirling green waters of Flathead River's South Fork in northwestern Montana. Named the Hungry Horse Dam, for a creek by that name 4 miles above the dam site, the new multiple-purpose barrier will serve Montana and the entire Columbia River basin. It will be exceeded in size only by Boulder, Shasta, and Grand Coulee, if the preliminary plans for the project are carried through.

Behind the massive concrete bulk, a possible 3,500,000 acre-foot lake will back up the gorge for 28 miles. This water, tapped from the reservoir, will irrigate 85,000 acres of rich land near Kalispell, Mont. The dam will also make possible the installation of between 72,500 and 286,000 kw, depending on the size of the structure. Other water, released for power production downstream, will boost Bonneville and Grand Coulee output on the Columbia River. And finally, all this water will improve navigation on the lower Columbia River below Bonneville.

Why all this electric power? Because the Bonneville Power Administration reports say there will be a power shortage in the Pacific Northwest by 1950 or 1951.

Preconstruction work is now under way at Hungry Horse under direction of the Boise Regional Office of the U. S. Bureau of Reclamation. Core drilling is in progress. Construction of a town site below the dam is so nearly an actuality that contracts for prefabricated houses have been let. And a contract has been awarded for a 4-mile, two-lane, 50-mile-an-hour highway from U. S. 2, the nearest hard-surfaced road. It will be cut in the side of a spectacular timbered gorge at a cost of nearly $500,000 dollars.

Construction of the dam was authorized by the 78th Congress, with initial appropriations made for preconstruction. Its final cost is not known. For at the present time studies are still in progress to determine the size of the reservoir and the amount of electrical-generation facilities to be installed. Both of these factors will affect the amount of power that can be generated at the site and at the downstream plants on the main Columbia. Also under consideration is the effect of Hungry Horse storage on the Foster Creek and McNary plants which are both in the design stage. Cost estimates range between $46,000,000 and $105,000,000, depending upon the final size of the project.

History of a Dam

All too often in the chronicling of a mighty new dam, little or nothing is ever said about the preliminaries. The men who dreamed a dream of harnessing a river are sometimes lost behind the rumbling thunder of concrete mixers; their ideas become common property. Take Hungry Horse, for example. If it is let and finished by 1951, it will have been 30 years a-building. And if government policy permitted, it could have been named Jones Dam . . . as we shall see.

Back in 1921 B. E. Jones, one of the best engineers of the U. S. Geological Survey, explored northwest Montana. His mission was to locate, if possible, a place where the Columbia River headwaters might be controlled. He trudged in through the wild and beautiful forested gorge of Flathead River's South Fork. Below him, flowing 3,350 cubic feet every second on a hydraulic slope of 12 feet to the mile, the treacherous river tumbled madly towards Flathead Lake, Clark Fork River, and the Columbia.

C. & E. M. Photo

Cables hold this drill barge in fast water as Bureau of Reclamation engineers recover a core sample from the Hungry Horse dam site. When construction of the huge concrete dam starts, the high walls of this narrow gorge will be a "natural" for cableway methods of placing concrete.

Red and green stream pebbles, mixed with dull blue stone, lay on the bottom

(*Continued on next page*)

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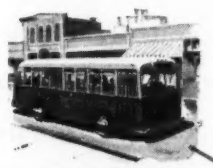
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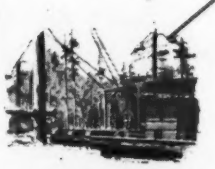
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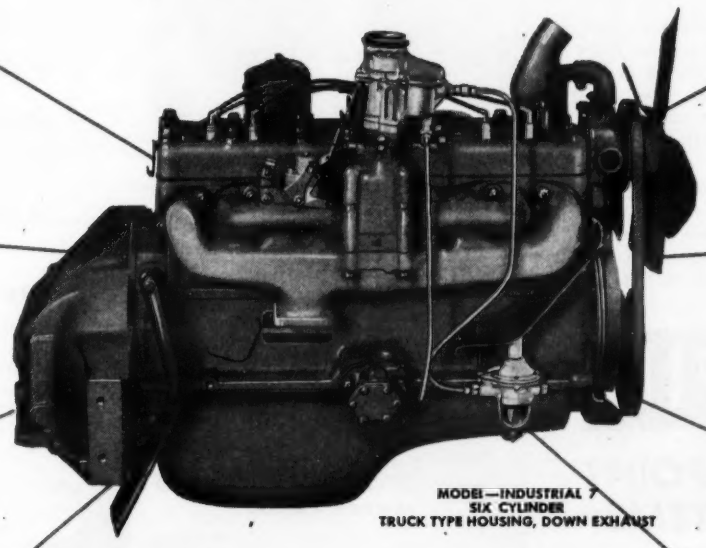
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Detailed Rock Study At Hungry Horse Dam

(*Continued from preceding page*)

of the river. In 30 feet of water the river bottom was visible, so Jones knew there would be no problem of reservoir sedimentation here. Rainbow trout 20 inches long crowded each other to leap at a mosquito hatch. What Jones saw that summer he summarized in a Government report. It bears the date of July 15, 1922. It reads in part: "There is a feasible dam site on the south fork of the Flathead River about 4 miles above the mouth."

The next year another man named Jones—this time Engineer E. E. Jones of the U. S. Geological Survey—made the same trip. His findings checked. But funds ran out, and the detailed reconnaissance and geologic examination was held up for 11 years.

During the working seasons of 1934, 1935, and 1936, engineers and geologists of the U. S. Geological Survey moved in to make a detailed study in three parts: topographic, geologic, and geophysical. In July, 1934, B. E. Jones, with R. K. Thies, made another investigation at the original dam site he had picked. The purpose of the study was to determine the depth of bedrock there. By using the Gish-Rooney electrical-resistivity measuring method, they found what had not been possible to locate before—subterranean gorges.

The gorge located at the dam site itself was an old channel of the river, which geophysical exploration estimated to be 48 feet deep. The South Fork, instead of following the glacier path, had cut a new course through the hard bedrock to the west. The fact that it did so, and cut into a hard Siyeh formation, has given the proposed dam its excellent foundation in a narrow high-walled canyon.

Jones and Thies found geologic conditions right at the dam site relatively simple. But other glacial gorges were found to have cut out of the reservoir about 5 miles above the dam site. Was there possibility of reservoir leakage through them? What was the elevation of bedrock? If it was below the flow line of the reservoir, would the water leak through the glacial till?

One of the most detailed geological studies that has ever been made was made at Hungry Horse, with the answers to these questions as its goal. Both resistivity and seismic methods were used to determine depth to bedrock, and both methods indicated a high divide. However, it was recommended that drill holes be put down into the glacial drift to check the geophysical results.

C. & E. M. Photo

Cores recovered from the Hungry Horse dam site on the Flathead River's South Fork in Montana are being placed in carefully numbered boxes for geological checking. They were taken in 5-foot lengths—or shorter, if a drill hung and had to be pulled.

The rock formations showed great contrast in age and lithology, but they fell into three easily understood classifications. Sedimentary bedrock beneath Siyeh limestone, covered by earth made in recent time, lies under Hungry Horse dam site.

Geology of a Dam

The bedrock is pre-Cambrian stone of great age, classified in the Belt series. The oldest of the Belt series rocks are dull red and greenish-gray Grinnell argillites. They appear, in 1946, only as rounded stream pebbles under the water or as ragged outcrops along the banks. But argillites are strong, tough, and elastic. They will not disintegrate under air or water. And some 70,000,000 years after these rocks were formed, concrete technicians of the U. S. Bureau of Reclamation are searching for deposits of Belt series argillites. For concrete takes aggregate, and the argillites

(*Continued on next page*)

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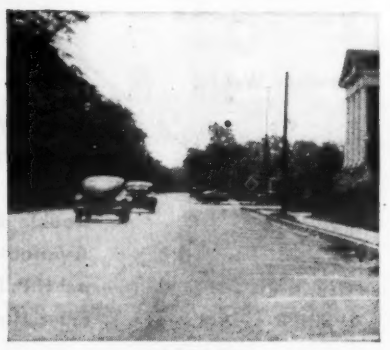

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Detailed Rock Study At Hungry Horse Dam

(Continued from preceding page)

are probably the answer.

Over the argillites lies a bed of Siyeh limestone 4,100 feet deep. (This will be the foundation rock for the dam, with bedrock exposed at the dam axis.) Its layers range from 1 to 14 feet thick. Seismic movement in ages past fractured this limestone much more than it did the older rocks. Crack patterns in Siyeh limestone assume a sharp angle, often 90 degrees, from the bedding plane. But the big blocks are well keyed into each other, and the geologists did not get excited over the Siyeh crack patterns. Certain impurities, revealed by chemical analyses, have made it necessary to classify Siyeh limestone for engineering purposes as an "incipiently metamorphosed, siliceous, magnesian limestone".

And then in the upper belt of this oldest Pre-Cambrian stratum appear the Missoula group. They consist of more red and greenish-gray argillites, but there are also some metargillites. They are truncated by faulting. Bedrock over most of the reservoir floor is in the lower Missoula group.

The great glaciers, known to geologists as the Kansan Till, the Illinoian Till, and the Wisconsin Drift, covered this ancient rock bed with Tertiary sediment. At Hungry Horse the geophysicists investigated two and possibly three distinct Pleistocene Age sheets of till or boulder clay, interglacial and postglacial river deposits, and lake beds.

The Recent Age deposits, which now cover most of the ground surface, include post-lake Missoula gravels of stream-bed origin, and some loose gravel.

Such was the geological picture they found. Good rock, generally, but suspicious and critical planes along the subterranean gorges. Then work stopped. Money ran out. Somewhere the ball was passed. And when Hungry Horse again heard the boots of men, they belonged to employees of the Corps of Engineers, U. S. Army. Now they had the exploration of the dam, and a copy of the 1934-1935-1936 report.

In 1939 the Corps of Engineers put down some core-drill holes, but instead of probing along the subterranean gorges, they drilled a dam site they proposed at Devil's Elbow, a very treacherous river bend. They checked very accurately what the USGS geologists had predicted at that point.

Finally the Bureau of Reclamation took over. And another geologist called Jones—Fred O. Jones—spent his time in 1945 and 1946 investigating and exploring the proposed dam site. As the first step, holes were drilled in the glacial gorges. Bedrock was found to be below the proposed flow line of the dam. But the glacial till was also found to be tight enough to allow only negligible leakage. As a result of later surveying and research, however, the axis of the dam has been shifted upstream about a mile—it is there that the present explorations are being conducted.

Core Drilling of a Dam

The consensus of experts, on the basis of field studies, was that the Hungry Horse dam site was feasible for a high structure. Public Law 329 authorized construction of a dam "to a height to provide a storage reservoir of the maximum usable and feasible capacity".

How much is maximum? How high is feasible?

Now that actual construction was almost upon them, engineers of the U. S. Bureau of Reclamation hurried to get the final answers. Another man named Jones—Project Engineer Paul A. Jones this time, the man who was an important inspector at Boulder Dam—moved in and established headquarters at Kalispell, Mont. The Bureau's best drillers from Grand Coulee were called. A diamond drill was brought in. The final story, including full exploration work along those ancient gorge walls, is now being prepared.

Present work is the first big battle so far as actual construction activity is concerned—a battle against a river. In the spring and early summer the South Fork carries snow run-off from peaks and more than 60 glaciers in the Flathead National Forest. Discharges of 60,000 cfs are not uncommon. A man falling in the river at those times is headed on a one-way trip, and the river has claimed many a life.

In order to hold floating equipment against the 15-mph current, 2-inch steel anchor bolts 6 feet long were drilled and grouted in solid rock at the axis of the dam. Steel cables were strung across the river from these anchors. A suspension bridge was built so the men engaged in digging exploration tunnels in both abutments could cross the river easily, when that was necessary. The anchored cable to hold floating drill equipment was fitted with a traveling block and shackle, so the barge could

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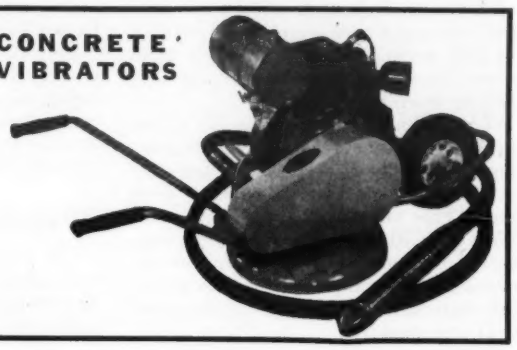

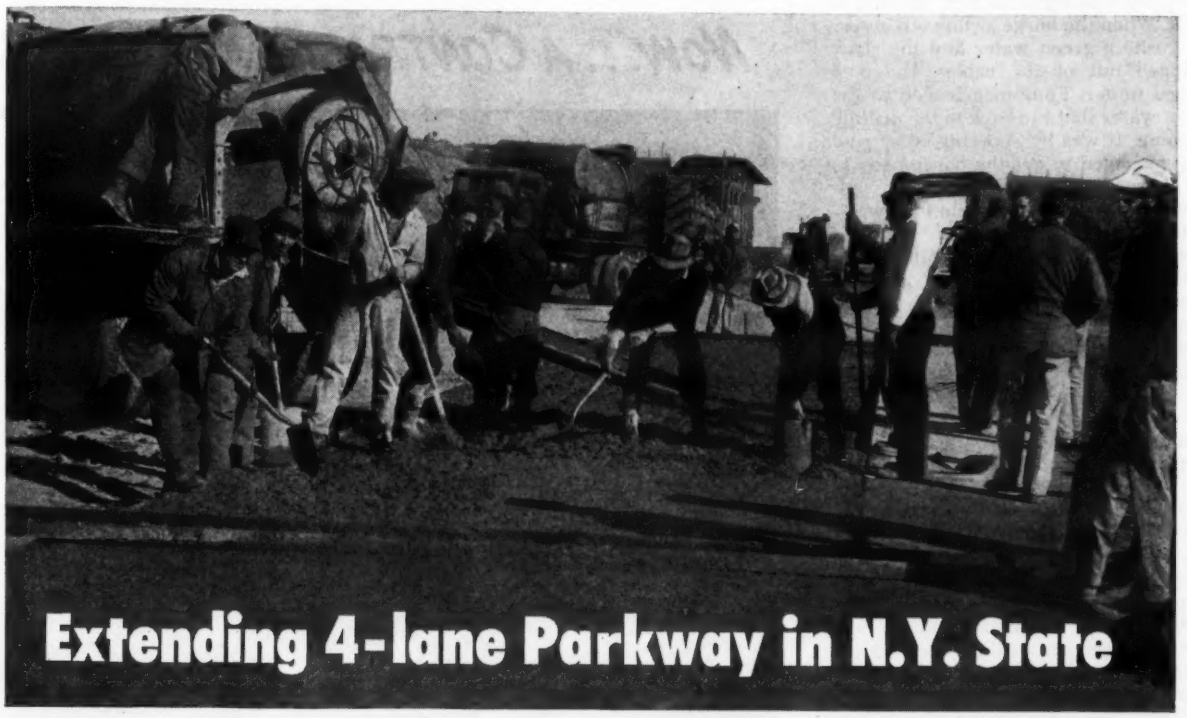

Extending 4-lane Parkway in N.Y. State

Paving gets under way at Freedom Plains, southernmost portion of new highway. Bridge approaches, of reinforced concrete construction, called for 10,800 sq yd of Bethlehem Bar Mats.

Long popular because of its scenic beauty and its complete lack of grade crossings, New York's express highway through the heart of Dutchess County—the Taconic State Parkway—is now being extended from Freedom Plains to Lafayetteville, a distance of approximately 27 miles.

These photographs, taken near Freedom Plains, show construction activity on a 7.8-mile stretch of the new road being built by Peter Mitchell, Inc., of Greenwich, Conn. Reinforcing bars, bar mats, welded fabric and dowels were supplied by Bethlehem.

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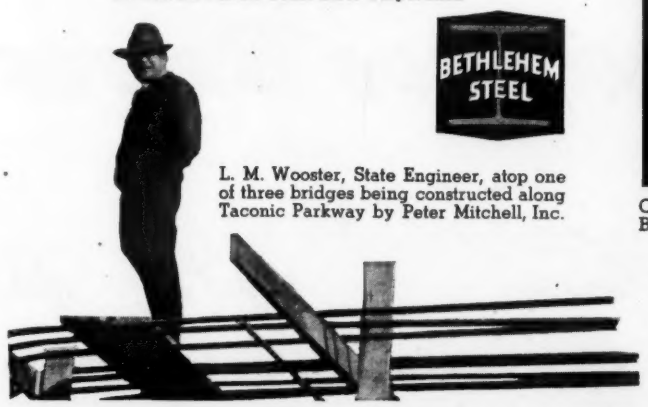
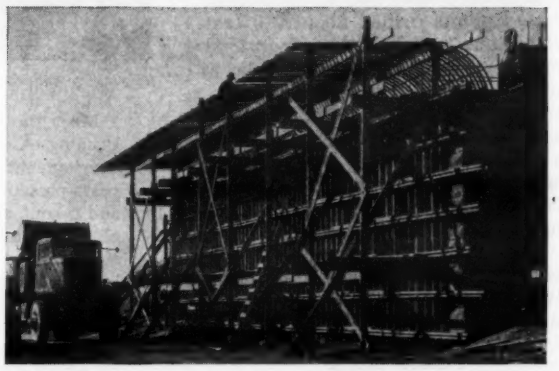


L. M. Wooster, State Engineer, atop one of three bridges being constructed along Taconic Parkway by Peter Mitchell, Inc.



Of rigid-frame concrete-arch construction, stone-faced, and with a 48-ft span, bridge will carry heavy parkway traffic.

Close-up of Bethlehem Reinforcing Bars in bridge structure. Bridge required 72,500 lb of these sturdy bars.

STEEL FOR HIGHWAYS

Road Joints • Reinforcing Bars • Bar Mats • Guard Rail • Tie-Rods
Guard Rail Posts and Brackets • Wire Rope and Strand • Spikes
Hollow Drill Steel • Fabricated Structural Steel • Bolts and Nuts
Sheet and H-Piling • Timber Bridge Hardware

Detailed Rock Study At Hungry Horse Dam

(*Continued from preceding page*)

be pulled up against the current or slacked down when changing location.

An access road was hewn out by a LeTourneau bulldozer blade, mounted on a Caterpillar D8. It follows the general route of a trail established by Jones in 1921. As high as this access road is in many places, the new access highway will be even higher.

Trucks hauled 16 pontoons 18 inches in diameter x 20 feet long over the pioneer road. They were lashed together at the dam site, and a wooden deck built. This made a floating work platform 32 x 20 feet. A wooden rake was bolted to the bow so the barge would not dip and swamp in the waves of the fast current. On this rig the diamond drill was mounted.

Cables were fastened to the barge. The river was high, but they decided to try it. When the barge swung out across the rushing green water and the slack whipped out of the cables, the bow dipped under. Four men leaped to get out of water that ran back to the drilling machine. It was by supreme effort that they managed to get the barge back to the shore. The experiment ended right there, for three weeks, while they waited for a lower stage of water.

When this project was visited, 150-foot core borings were being made at locations recommended by the Denver Office design section. Cores 1⅞ inches in diameter were being pulled, classified, and boxed. Drilling was going on five days a week, three 8-hour shifts per day.

In drilling a core, a 4½-inch pipe was first driven about 10 feet through the loose gravel of the Recent Age to solid rock. During the operation, the barge had to be held against the current by two ⅝-inch steel cables. For at low-water stage the river is about 7 feet deep, but it rushes like mad.

Drilling was constant at an average rate of 2 feet per drilling hour. Cores were recovered in 5-foot lengths, but of course shorter pieces were recovered if a drill hung and had to be pulled. Diamond points drilled about 240 feet in Siyeh limestone before the industrial diamonds wore out. A drilling crew finished a 150-foot hole in five days.

An important aspect of the drilling was the water-pressure test. Each hole was sealed at various levels. Water pumped at the high-pressure grouting mark was forced in to see how much would get away through those cracks the geophysicists discovered. It was essential to discover what they now know: that high-pressure grouting is going to seal the cracks successfully.

Future Plans

With construction planned for 1947, lasting from 4 to 5 years, Hungry Horse Dam at last seems a reality after nearly three decades, half a lifetime. But construction will certainly be no picnic. The working season is short. The mean annual temperature is only 41 degrees. And in the winter it dips as low as 34 degrees below zero, with 122 inches of snowfall.

The job of clearing evergreens out of the reservoir will be enormous, for they are matted so closely that visibility is very often under 30 feet. However, the high walls of the narrow gorge where the abutments are located are a "natural" for cableway methods of placing the concrete. And it is expected that Hungry Horse will be one of the big and spectacular jobs of the next five years. It is virtually certain to bring out some advanced construction technique.

Concrete technicians are already busy exploring the site for sources of aggregate for a 3,000,000-cubic-yard concrete pour. Howard S. Latham, Project Safety Engineer, is busy outlining his safety program in advance, for the hazards are certain to be enormous. He is drafting information and forms to acquaint all who will work on Hungry Horse Dam with the hazards and how to sidestep them. This is a refinement of past Bureau of Reclamation policy.

Such is the background of Hungry Horse. To those who believe a great dam starts with the pouring of concrete —and many do—the story of Hungry Horse may be enlightening.

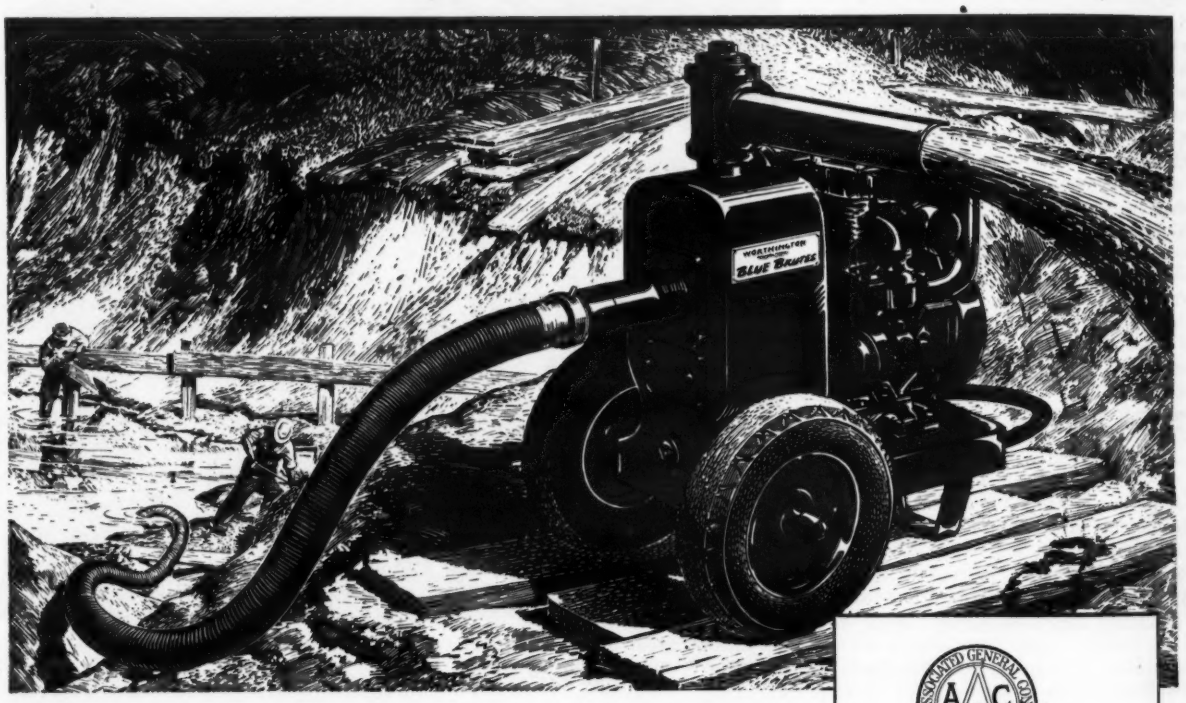
Paul A. Jones will be the Project Engineer. R. J. Newell is Regional Director of the Bureau of Reclamation, with headquarters in Boise, Idaho, and Walker R. Young is Chief Engineer in Denver, Colo.

West-Coast Office Opened

The opening of a new store and district office has been announced by Air Reduction Sales Co., New York City, maker of welding and cutting equipment. In addition to retail sales and storage departments, the new headquarters has a demonstration room. It is located at 1485 Park Ave., Emeryville, Calif., and is under the direction of H. W. Saunders, District Manager.

USE
DAREX AEA
if you want concrete that . . .
places easier . . . takes less time and labor
DEWEY AND ALMY CHEMICAL COMPANY, CAMBRIDGE 40, MASS.

NOW . . . A CONTRACTOR'S PUMP BY WORTHINGTON



Meet the Blue Brute Portable Self-Priming Centrifugal Pump, newest development of Worthington's 100-years-plus of experience in the design and manufacture of pumps. Fabricated of rust and abrasion-resisting alloy steel, it is ruggedly built to take the hardest knocks, yet light in weight for easy portability.

Fast, unfailing self-priming is a built-in feature of its advanced hydraulic design — not a troublesome auxiliary device. There is no priming valve to get out of order, none of the usual "recirculation" that reduces capacity or efficiency. The result is quick, dependable pick-up of water at all times.

Thoroughly tested in the modern research laboratories of the world's largest builder of pumps, this latest addition to the famous Blue Brute Construction Equipment line is a compact, streamlined portable pumping unit — in which simplicity of design and sturdiness of construction provide top performance under severest operating conditions . . . further proof that *there's more worth in Worthington-Ransome.*

For additional information on Blue Brute Portable Self-Priming Centrifugal Pumps, see your nearby Worthington Distributor. Or, write for Bulletin W-2010-B2.

H6-25

Blue Brute Pumps are built to the standards of the Associated General Contractors of America, Inc., and carry the A.G.C. rating plates.

Your Blue Brute Distributor will gladly show you how Worthington-Ransome construction equipment will put your planning on a profitable basis.

WORTHINGTON

Worthington Pump and Machinery Corporation, Worthington-Ransome Construction Equipment Division, Holyoke, Mass.

BUY BLUE BRUTES

IF IT'S A CONSTRUCTION JOB, IT'S A BLUE BRUTE JOB

Side-Hill Grading Improves Road Line

Tractor Used in Cutting Down Slopes; Rock Holes Made With Wagon Drills And Jackhammers

SHARP reverse curves and short vertical sight distances have been eliminated from a 1-mile section of State Route 14 just west of Hartford, Vt., on a grading and paving contract totaling $111,417.80. The job was awarded by the Vermont Department of Highways to the firm of Lambert & George of Montpelier, Vt. It started operations April 1, 1946, and was scheduled to finish this spring.

The highway project is located in the eastern part of the Green Mountain State along the north shore of the White River. There the old road had been built into the sides of hills which rise abruptly from the banks of the water course. As these hillsides contain a considerable amount of ledge rock, the old road had been designed with sharp curves, both horizontal and vertical, in order to avoid heavy cuts. In modern road building a safer alignment is expected; so this improvement straightens out the curves and flattens the grade, besides widening the roadway surface from 18 to 20 feet. Since no detours were available in this vicinity, traffic had to be maintained during construction. In the summer months when a great number of vacationists use the highway, this requirement offered quite a problem.

Rock Cuts

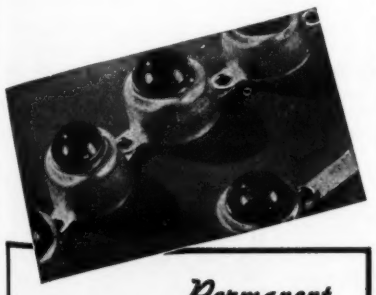
The 3-inch macadam surface on the original road was easily torn up with dozer blades. Then the contractor went to work on the rock cuts. Drilling equipment included two wagon drills, an Ingersoll-Rand and a Sullivan, together with four Ingersoll-Rand Jackhamers. Air was furnished by two 210-cfm compressors, a Worthington and an Ingersoll-Rand. These portable units were easily shifted about the job to any location. Cuts as great as 20 feet were required in some rock sections, and the deep holes were made with the wagon drills equipped with 1⅛-inch drill steel.

Ingersoll-Rand Jackbits were used throughout the job, and in the softer ledge rock a single bit often sufficed for 18 to 20 feet of drilling. When hard white quartz rock was encountered, the bits naturally had to be changed more often. At the start of a hole 2¾-inch bits were used, and sizes were reduced by ⅛'s down to 2¼-inch. In the Jackhamers ⅞-inch drill steel was used, beginning with 4-foot lengths and increasing by 2-foot increments to a maximum of 14 feet, while the bit sizes decreased from 1¾ to 1¼-inch.

The holes were charged with du Pont dynamite in strengths of 30, 40, and 60 per cent according to the varying conditions met in the cuts. With the harder rock, or in the snakeholes at the bottom of a sidehill cut, the 40 and 60 per cent powder was used. In the softer shaly material the 30 per cent powder was employed for a slower action and a greater lift. Primacord was used in

(Continued on next page)

C. & E. M. Photo
An Ingersoll-Rand wagon drill averaged 6 feet with one bit on 14 to 16-foot snakeholes through hard white quartz, on the Lambert & George 1-mile grading and paving contract in Vermont. Here an I-R 210-cfm compressor in the background supplies air.



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BRIGHT SIGNS
for DETOUR SIGNS and BARRICADES

● Detour Signs easily made with Cataphote Chain Reflectors can be used over and over again. No loss of reflection. Also wood mounted buttons for wooden temporary signs. Low cost. Send 25c for samples. Specify Cataphote when ordering from your dealer. Cataphote Corp., Toledo, Ohio.

CATAPHOTE REFLECTOR CHAINS

MOVE THE EARTH WITH GAR WOOD EQUIPMENT

Yes, Gar Wood Hydraulic Hoists and Dump Bodies move the earth. Not as illustrated, of course, but all over the world on earth moving projects such as dams, highways, railways, airports and many more, Gar Wood equipment is on the job, doing it fast, easily and economically.

In addition to earth moving there are Gar Wood Hoists and Bodies especially designed for the efficient hauling of coal, rock, sand, gravel, garbage, rubbish and other materials.

For the answer to your hauling problem consult your nearest Gar Wood Branch or Distributor. There's one in every principal city.

GAR WOOD INDUSTRIES, INC.
Hoist and Body Division
WAYNE, MICHIGAN

ALSO BUILDERS OF WINCHES & CRANES . . . TANKS . . . ROAD MACHINERY . . . DITCHERS & SHOVELS . . . HEATING UNITS . . . BOATS

Side-Hill Grading Improves Road Line

(*Continued from preceding page*)

the blasting, and this permitted the use of much more extensive charges than would be possible with a battery limited to, say, 50 holes. As many as 190 holes were shot at a time, and resulted in breaking up as much as 3,000 cubic yards of rock. With these bigger blasts, considerable dynamite was saved; the rate dropped from ½ to ⅜ pound of powder to open up a cubic yard of rock.

After the blasts the material was loaded by two Lorain shovels, a 1½ and a ¾-yard unit, into four contractor-owned trucks: two 10-wheel Fords of 6-yard capacity, an International 5-yard, and a White 4-yard. On this short job the average haul was well within ½ mile on the roadway excavation. Not enough material was available from the cuts, however, to complete the fills. So two borrow pits were resorted to. One was along the roadside at about the center of the job, and the other was ½ mile beyond the west end of the project. From these two locations 45,000 yards of borrow was obtained. The material was leveled off with two Caterpillar D7 tractor-dozers and spread in a maximum of 12-inch layers. For compaction one of the tractors pulled a Bros sheepsfoot roller over the fills giving each layer at least six passes.

Working a 10-hour day, 6-day week, the two shovels averaged from 1,600 to 1,800 yards of excavation a day, whether working on the roadway cuts or loading material from the borrow pits. Of this total, the larger 1½-yard model averaged around 1,000 yards; the remainder was handled by the ¾-yard unit.

Dozer on Slopes

Considerable grading also had to be done on the sidehill slopes which reached a maximum length of 225 feet rising steeply from the river. These slopes were flattened down to a 1½ to 1 gradient. Over 12,000 cubic yards of material was removed in the short space of 5 days with the use of a single D7 tractor-dozer.

A new tractor, equipped with a LaPlant-Choate 10-foot blade and a Hyster D7N winch, was used by the contractor in a rather ingenious manner to cut back these slopes. One end of a 280-foot length of 1-inch steel cable was fastened to a stout tree at the top of the slope, and the other end connected to the winch. Then the tractor operator put his machine out of gear, set the hoist working, and proceeded to pull himself and the tractor up the hill to where the cut had to be made. With the winch locked, the operator dozed the material from the slope, working along from section to section. The dirt and rock rolled down the hill to the toe of slope where it was picked up by the shovels and loaded into trucks to be carried away. The $2,000 winch more than paid for itself, according to the contractor, with the work it accomplished within a week.

C. & E. M. Photo
A new Caterpillar D7 tractor with a 10-foot LaPlant-Choate blade backfills a culvert trench on the Lambert & George contract. E. O. Webster at the left, Resident Engineer on the job, discusses problems with James E. Lambert, Superintendent.

Bituminous Surface

After grade was reached, a layer of gravel from 15 to 24 inches thick was laid as a sub-base and compacted with a Hercules 10-ton 3-wheel roller. The gravel was obtained from the river; this is shallow enough along the shore so that the shovel could work in the water and fill the trucks which backed in to a depth of 1 or 2 feet for loading. After the gravel was dumped it was spread by the dozers and compacted by the roller.

When the material had thoroughly dried out, a tack coat of ⅓ gallon tar was applied to the surface for a width of 22 feet. While the pavement is only 20 feet wide, the extra foot of bitumen was added on each side to check raveling along the edges of the road. This process was repeated to make a double seal. Only the second time, the tar was sprayed on at the rate of ¼ gallon to the square yard and followed by a layer of peastone applied at the rate of 125 cubic yards to the mile. Both

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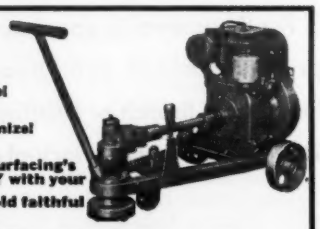
Be wise!
Economize!
Road surfacing's EASY with your Good old faithful



BERG

CONCRETE HI-WAY SURFACER

OLD? Yes! . . . The BERG has been on the market since 1924.

But NEW, TOO . . . . . constantly improved, until today it provides the fastest, easiest, most effective, most economical method available.

The CONCRETE SURFACING MACHINERY COMPANY
4985-4989 Spring Grove Ave. Cincinnati, Ohio

Off went the Boiler—
Down went the Costs

When Valentine Clark changed its log handler from steam to Diesel power, a lot of things happened.

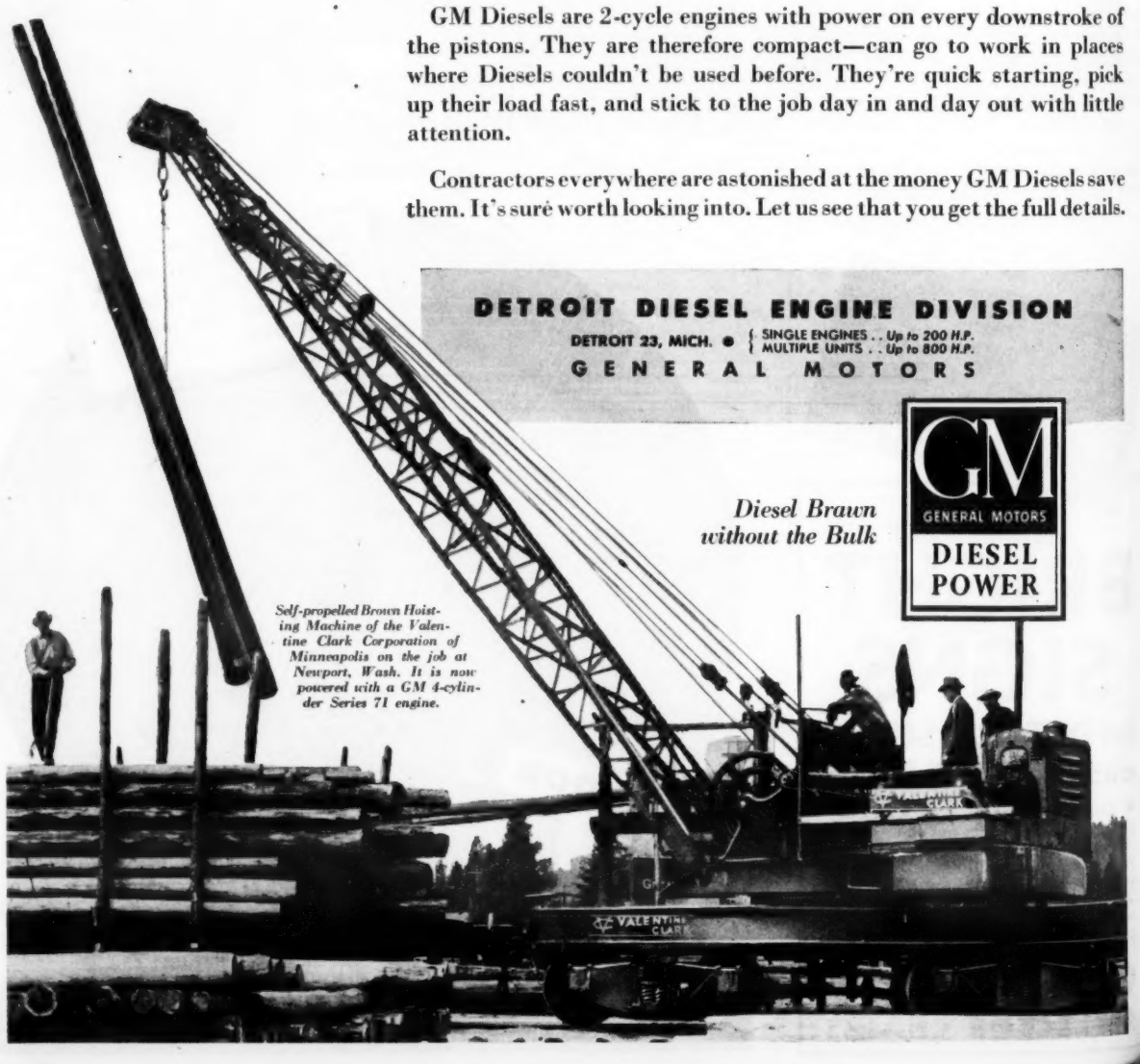
First, $60 a week was saved on boiler tending. Maintenance nose-dived. The machine was always ready at the touch of a button. And, very important, a dangerous fire hazard was ended.

All this just emphasizes the money to be saved and the advantages to be gained by using General Motors Diesel power.

GM Diesels are 2-cycle engines with power on every downstroke of the pistons. They are therefore compact—can go to work in places where Diesels couldn't be used before. They're quick starting, pick up their load fast, and stick to the job day in and day out with little attention.

Contractors everywhere are astonished at the money GM Diesels save them. It's sure worth looking into. Let us see that you get the full details.

DETROIT DIESEL ENGINE DIVISION
DETROIT 23, MICH. • { SINGLE ENGINES . . Up to 200 H.P. / MULTIPLE UNITS . . Up to 800 H.P.
GENERAL MOTORS



Self-propelled Brown Hoisting Machine of the Valentine Clark Corporation of Minneapolis on the job at Newport, Wash. It is now powered with a GM 4-cylinder Series 71 engine.

Diesel Brawn without the Bulk

GM
GENERAL MOTORS
DIESEL POWER

Side-Hill Grading Improves Road Line

(Continued from preceding page)

courses were well rolled by the smooth-wheel roller.

The tar was supplied by the Barrett Division, Allied Chemical & Dye Corp. of New York City. The cover stone came from a crusher of the Vermont Sand & Gravel Co., located in the town of Rockingham, about 40 miles south of the project. After the top seal had been completed for the 20-foot width of pavement, the shoulders were built up to an 8-foot width on each side, making a 36-foot roadway. The slopes bordering the river were strengthened against erosion by placing on them a 5-foot layer of rock which had been previously excavated from the roadway.

The principal drainage structures were a new 7 x 7 x 76-foot reinforced-concrete box culvert, and a 6 x 7 x 35-foot extension of an existing culvert of similar construction. Batches were mixed from Lehigh portland cement, sand, and washed gravel. The aggregate was supplied by the Vermont Sand & Gravel Co. of Bellows Falls, Vt. The supplier delivered the material to the job in trucks after a 40-mile haul, and mixing was done in a Knickerbocker 10-S mixer.

Equipment was greased daily with Alemite grease guns, while the Standard Oil Co. of New York furnished oil, gasoline, and diesel fuel from a station at White River Junction.

Quantities and Personnel

The major items included in this 1-mile grading contract were:

Earth excavation, roadway and borrow	63,000 cu. yds.
Rock excavation	10,000 cu. yds.
Stone fill on slopes	8,500 cu. yds.
Gravel sub-base	12,000 cu. yds.

James E. Lambert, a member of the firm of Lambert & George, supervised the working force which averaged 15 men. E. O. Webster was Engineer in charge for the Vermont Department of Highways, which is headed by Hubert E. Sargent, Commissioner and Chief Engineer. F. C. Coates is Construction Engineer.

Snow-Plow Blade Has Hydraulic Controls

Its snow plows are available for immediate delivery, advises the Hammett Machine Works, Inc., 466-482 Eighth St., Troy, N. Y. The No. 30 plow consists of an 8-foot V and 9-foot wing-blade combination which is hydraulically operated.

Control valves are mounted, as a complete hydraulic sectional unit, on the truck's dashboard. The moldboard is said to penetrate snow with a minimum amount of traction, the thrust being delivered low in the plow nose. In addition, the weight of the snow creates a downward thrust with minimum side thrust, according to the manufacturer. The wing cutting angle remains the same, regardless of the position of the wing, and all cables are said to be easily accessible for adjustment.

Further information may be secured from the company, or by using the enclosed Request Card. Circle No. 31.

Data on Asphalt Plants And Related Equipment

Cummer asphalt plants and related equipment are described in the bulletin "No. 1200 Portable Plant", distributed by The F. D. Cummer & Son Co., B. F. Keith Bldg., Cleveland 15, Ohio.

Capacities of the 1200 portable combination plant are said to be 50 to 80 tons per hour for hot-mix, and 45 tons per hour for cold-mix. Mixers are available in 2,000, 3,000, or 4,000-pound capacities. The plant features two units: a two-fire drier in two sizes; and a new-style Cummer mixing tower in two sizes. All portable plants described in the announcement are designed to be dismantled for transport on railroad or flat-bed trailers.

The bulletin contains pictures of the various models of plants, as well as the mixers, the Cummer-Robins vibrating screen, internal-fire driers, combination drier-coolers, asphalt buckets, and mechanical feeders. Accompanying text outlines the principal features.

Copies of this literature may be obtained from the company. Or use the enclosed Red Request Card. Circle No. 88.

Birmingham Offices Join

The Birmingham office of the Robins Conveyors Division was recently consolidated with that of the Hewitt Rubber Division, both of Hewitt-Robins, Inc. The new office is located at 615 No. 9th St., Birmingham 4, Ala.

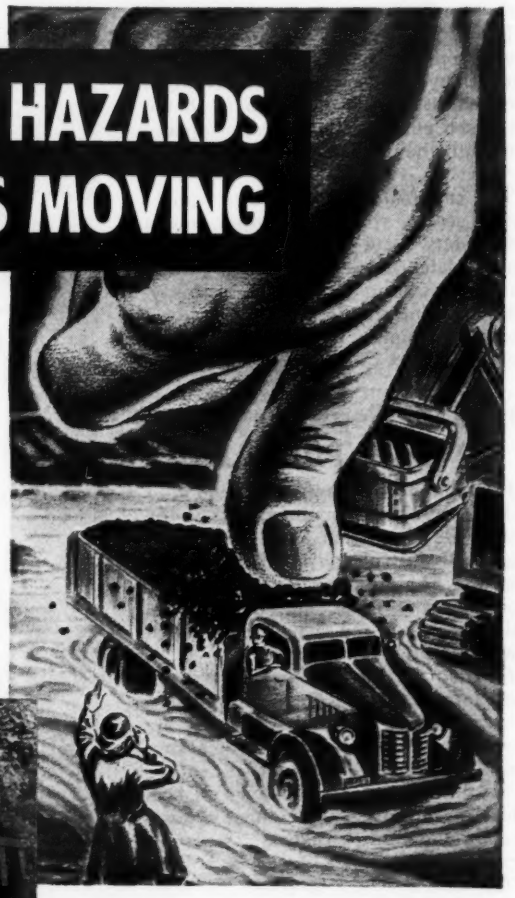
Beat Hand Sawing Ten to One . . . .

Van Dorn Portable Electric Quick-Saws* save money, muscle and man-hours on every construction sawing job. They finish jobs ten times faster than by hand. Rip, crosscut, miter, dado. Cut wood, compo-board, slate, tile, marble, asbestos, galvanized sheet. Models for cutting to depths of 2 3/8", 2 5/8", 3 1/8". Ask your nearby Van Dorn Distributor or write for our free "Electric Quick-Saw Handbook" to: The Van Dorn Electric Tool Co., 787 Joppa Road, Towson 4, Maryland.

*Trade Mark Reg. U. S. Pat. Off.

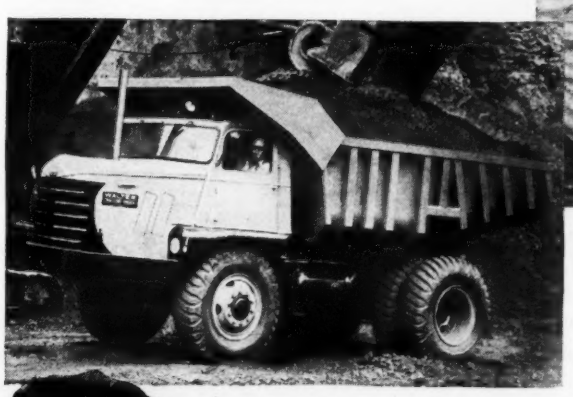
For Power Specify "Van Dorn" DIV. OF BLACK & DECKER MFG. CO. PORTABLE ELECTRIC TOOLS

How to BEAT WEATHER HAZARDS and KEEP SCHEDULES MOVING



WHEN you sign the contract and set your schedules, *you can't predict the weather!* A siege of bad weather and difficult running conditions that stop your trucks, can be mighty costly.

You are not at the mercy of the weather with Walter Tractor Trucks. As long as shovels can dig, these giant trucks will haul. When conventional two--and four-wheel drives are stopped by soggy ground, mud, slippery surfaces and grades . . . Walter Tractor Trucks keep loads moving.



Right: WALTER 20-TON DUMPER

Below: WALTER TRACTOR TRUCK hauling 40 ton trailer

There's a sound reason for this—the Walter 4-Point Positive Drive. In this drive, three automatic locking differentials act as a "mechanical brain," proportioning power to each of the FOUR driving wheels according to its traction at any instant. There is no wheel spinning to bog down trucks, because power is automatically concentrated on the *working* wheels at all times.

As you start your season, get full facts on the many engineering features and operating advantages of Walter Tractor Trucks for severe off-the-road hauling.

WALTER MOTOR TRUCK CO.
1001-19 IRVING AVENUE,
RIDGEWOOD 27, QUEENS, L. I., N. Y.

WALTER TRACTOR TRUCKS

A hydraulic power-steering system and an enclosed cab are now available as optional equipment for the Scoopmobile.

Power Steering, Cab Are Operational Aid

Two accessories are available as optional equipment for its Scoopmobile, announces Mixermobile Manufacturers, 6855 N. E. Halsey, Portland 16, Oreg. They are an enclosed cab and a hydraulic power-steering system. The Scoopmobile is a tricycle type of materials-handling unit.

Power steering has been adapted to the Scoopmobile through the use of a Vickers hydraulic system. According to the manufacturer, tests have shown increased efficiency and ease of operation with the addition of this hydraulic unit.

The cab features a full-size upholstered seat, a windshield wiper, and a large safety-plate windshield. The doors may be latched open in warm weather. The cab is said to provide full visibility.

Further information may be secured from the company, or by using the enclosed Request Card. Circle No. 24.

Oil Seal Features Split Pillow Block

Production of a newly designed split pillow block has been announced by the Shafer Bearing Corp., 1412 W. Washington Blvd., Chicago 7, Ill. It is said that the Shafer-improved split pillow blocks permit quick and easy installation, removal, and replacement of the shaft without misalignment.

Positive-alignment dowel bolts are used to provide quick, sure alignment of cap, bearing, and base. No separate dowels are needed, and the base allows 2 or 4-bolt mounting. Another feature is the Shafer-patented Z-type oil seal which, according to the company, positively retains lubrication and seals out foreign matter.

The Shafer block employs the self-contained Series DE-22000 self-aligning bearing, with two roller assemblies, a one-piece outer race, and a spherical inner race. It is said to be universally adaptable to line-shafting or machine installation in all industrial equipment, and readily interchangeable with all other makes of split pillow blocks.

Further information may be secured from the company, or by using the enclosed Request Card. Circle No. 50.

Brass-Collet Line

A new line of precision draw-in collets made of brass has been announced by the South Bend Lathe Works, 114 E. Madison St., South Bend 22, Ind. Made to the same exacting tolerances of hardened-steel collets, their low cost is said to make them especially desirable for odd sizes that are used only occasionally. However, the company states that they will perform satisfactorily for short-run production jobs.

They are made in either fractional-inch sizes, decimal-hole sizes, or metric-hole sizes. When worn, brass collets can be rebored to a larger diameter. Also, they can be machined for holding tapers or irregular shapes.

Designed primarily for use with South Bend lathes, they are available in four styles and can be purchased for use with other machines.

Further information may be secured from the company, or by using the enclosed Request Card. Circle No. 49.

N. Y. Agent for GM Diesel

The Griffin Equipment Corp., New York City, has been appointed exclusive industrial distributor for GM diesel power by Detroit Diesel Engine Division, General Motors Corp. The territory which this firm will cover includes metropolitan New York, southern New York state, and northern New Jersey. All sales and service activities will be in charge of H. J. Hush, Vice President of the Griffin Equipment Corp.

A new building will be erected at 880 E. 141st St., New York 54, N. Y. It will include a large showroom, a duplicate of the model parts department developed at the GM Detroit diesel plant, and a stock of GM diesel engine and power units ranging from 40 to 800 hp.

TUTHILL
GUARD RAILS
SAFETY
APPEARANCE
VISIBILITY
TUTHILL GUARD, with its convex surface and spring brackets, is safer, for two reasons. It can be seen quicker at longer distances. Its deflective action deflects cars back into highway and absorbs impact. Result—more lives saved—less damage to car and guard rail. Low upkeep cost.
Request Details
TUTHILL SPRING CO.
762 W. POLK STREET, CHICAGO 7, ILLINOIS

That's Real "Down-to-Earth Moving"!

When it comes to earth moving, those Oliver "Cletrac" crawler tractors are in a class by themselves. The way those babies handle themselves in that rough going is a sight to behold.

My Oliver "Cletrac" dealer was the boy who gave me the dope on stepping up our schedules. "Look," he said, "when you're dozing or scraping, you get an uneven load on the tractor. So you've got to keep jackknifing from side to side to overcome the uneven pull. That is, unless you've got Cletracs on the job. They have an exclusive steering principle that permits them to balance the pull of one track against the pull of the other. You can keep an offset load moving straight ahead . . . there's no wasted motion. And, they are easier and safer to handle on rough, steep and uneven ground."

He had the right angle, all right. Why we've cut our clearing time right down to the bone. The Oliver "Cletrac" dealer sure knows this earth-moving business. He's a good man to know!

OLIVER Cletrac SALES SERVICE

Cletrac

a product of

The OLIVER Corporation

Industrial Division: 19300 Euclid Ave., Cleveland 17, Ohio

"THE SIGN OF EXTRA SERVICE"

Roadside Problems Discussed at Meeting

Sixth Annual Short Course Has Large Attendance; Land Acquisition and Use, New Developments, Roadside Plantings Among Topics Covered

✦ NEW developments and problems in roadside operations and their relation to the thoughtful planning, construction, and maintenance of our highways were discussed at the Sixth Annual Short Course on Roadside Development in Columbus, Ohio, February 13-15. Sponsored by Ohio State University and the Ohio Department of Highways, the meeting was attended by 195 engineers and others interested in this phase of highway work, from fifteen states and Washington, D. C. Professor Charles R. Sutton, Department of Landscape Architecture, Ohio State University, and Dallas D. Dupre, Jr., Landscape Architect for the Ohio Department of Highways, planned and arranged the 2½-day program.

First Session

The first session was opened by Professor Sutton and Dean Charles E. MacQuigg of the University's College of Engineering. The meeting was then turned over to Wesley L. Hottenstein, Supervisor of Highway Forestry, Pennsylvania Department of Highways, as Presiding Chairman. Some of the problems of roadside plantings was the general subject. Mr. Hottenstein outlined four fundamentals for successful roadside planting: (1) selection of species suitable to the locality, in order to lessen outbreaks of disease and pests; (2) healthy and pest-free stock insured by careful inspection; (3) good planting technique; and (4) proper maintenance until the planting is established. Intelligent specifications and thorough enforcement are essential.

The first paper was presented by M. G. Farleman, Research and Sales Engineer, California Spray-Chemical Corp., South Haven, Mich. His subject was the use of insecticides and germicides on the roadsides and in roadside parks. Mr. Farleman discussed various advances in insecticides during the war, their characteristics and uses. Although DDT has been most publicized, there are a number of others. He cautioned against the use of high pressures in spraying because of the drift into nearby agricultural land. He stated that the use of additives and stickers in the spray to resist weathering and prevent washing off have proved their value. The three essential factors in the battle against insects are the proper selection of the materials, proper direction of the spraying crews, and timeliness.

"Weed Control by Chemical Treatment" was discussed by Franklin D. Jones, Chemist, Horticultural Division, American Chemical Plant Co., Detroit, Mich. Much of Mr. Jones' discussion dealt with 2-4-D which has been used successfully and economically. Mr. Jones stated that it has little effect on animals, birds, or fish; it provides selective action on plant life; its cost of application is low; it does not stain or irritate the skin; and the area can be re-sowed in a comparatively short time. In this field also, there are a number of new developments. As in the battle against insects, timeliness is important, and the work should be done while the weeds are in an active state of growth, before going to seed.

Dr. Curtis May, Principal Pathologist, U. S. Department of Agriculture, Beltsville, Md., was the final speaker at the first session. Discussing shade-tree diseases, principally Dutch elm disease, Phloem necrosis, and canker stain, Dr. May defined disease control as the avoidance of situations which lead to the development of disease, as well as the treatment of sick trees. Planting a variety of species instead of a single

(*Continued on next page*)

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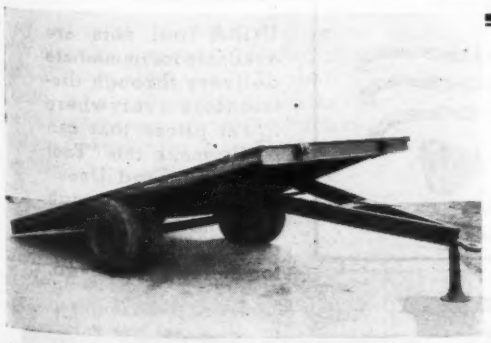

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Roadside Problems Discussed at Meeting

(*Continued from preceding page*)

type will help, he said. Diversified material is an insurance against loss, and can be fully as effective and interesting as the single type. Since many tree diseases, such as canker stain, are highly contagious, contamination frequently occurs from pruning tools. Spread of these diseases can be prevented by the use of sterile tools and antiseptic tree dressing for wounds. Moreover, the life expectancy of roadside trees should be about 75 years. So it is economy to take the necessary precautions to preserve trees during construction as well as by prevention of disease.

Pictures Tell Story

The theme of the dinner meeting was "Selling a Program by Good Photography". Harold J. Neale, Landscape Engineer, Virginia Department of Highways, presided. Mr. Neale summarized the 1946 report of the Roadside Development Committee of the Highway Research Board. He recalled the essential factors of the complete highway—utility, safety, economy, and beauty. And he reiterated that the achievement of the complete highway requires complete cooperation among all members of the highway department.

He then introduced the first speaker, Francis W. Davis, Head of the Department of Photography, Ohio State University. Mr. Davis talked on the technical approach to good photography, describing the equipment needed and its use. He stressed the importance of spending the time to learn to use a camera effectively.

Robert W. Wheaton, Chief Photographer, Ohio Division of Forestry, defined a good picture as one which shows what you want to show. Mr. Wheaton showed a series of his pictures, and discussed composition and other aspects of good and bad pictures.

The use of pictures in selling a highway program to the public has not been fully developed. But before it can be, the essentials of good photography must be mastered by those taking the pictures. This reminder, plus the pleasure derived from looking at good pictures, was the purpose of the program.

Second Session

Today's approach to roadside planning, construction, and maintenance was the topic for the morning discussion of the second session. Emmett Karrar, Professor of Highway Design of the Department of Civil Engineering, Ohio State University, was Chairman.

The first speaker was George S. Bonn of the editorial staff of *Better Roads* whose topic was on-the-job training. Mr. Bonn outlined the educational provisions of the G.I. Bill of Rights and its applications to the training of personnel in highway departments. He stated that highway departments are not making full use of this opportunity in solving personnel problems and up-grading present employees. Highway departments badly need trained men, and Mr. Bonn stated that there are many advantages in training men within the departments to meet their particular requirements. Twenty states have such training programs in their highway departments, for all types of jobs, including surveyors, engineering aids, roadside-development engineers, and even assistant highway engineers.

Rollin J. Smith, Research and Consulting Engineer, Kansas City,. Kans., then discussed experiments with his patented specially refined cut-back asphalt as a mulch in seeding operations. The purpose of his research was to develop a material which would be non-toxic, adherent, and soft when applied, which would harden and crack and not heal. Water must be able to pass through the cracks in this material and moisten the soil. Mr. Smith described the research and experiments involved in its development and showed slides of the results.

Nelson M. Wells, Landscape Engineer, Landscape Bureau, New York State Department of Public Works, discussed specifications covering roadside-development operations. In his state he has set up a somewhat unusual type which is tailor-made for each project, yet geared for mass production. The theory behind such a change is this: standard specifications are appropriate when dealing with static materials—but landscaping operations must be variable to fit the site and conditions of each project. These differences should be reflected in both specifications and methods. In carrying out this policy, specification verbiage has been reduced and the requirements set forth in chart form; plans have been streamlined to minimize the man-hours required for their preparation. Roadside-development work is awarded separately instead of being tied into grading or paving contracts. Mr. Wells believes that this will serve to stimulate contractors to concentrate their practical experience on this type of work.

Another innovation in New York State reported by Mr. Wells is the stockpiling of all topsoil for use elsewhere if not needed on the particular project. This is a conservation measure to insure that no arable soil is lost.

A paper "Something New in Roadside Operations Equipment" was prepared by John Greene, Seaman Motors, Inc., Milwaukee, Wis. Due to Mr. Greene's enforced absence, it was read by H. G. Sours, former Ohio Director of Highways and now of the firm of Baldwin & Sours, Columbus. This paper discussed the application of the Seaman Pulvi-Mixer in preparing the seed bed for roadside shoulders and flat slopes, or for pulverizing sod in road-shoulder reconditioning.

Continuing the discussion of equipment in roadside operations, E. Paul Shisler, Landscape Architect, Ohio Department of Highways, described a variety of practical equipment for roadside construction and maintenance operations. Mr. Shisler spoke of the need for vision and imagination in adapting equipment and tools to roadside work. He urged greater cooperation by contractors and the contracting agency in developing new tools and using available ones. Among the most useful equipment, Mr. Shisler mentioned the Seaman Pulvi-Mixer for the preparation of soil for seeding; the earth auger for digging holes for shrub planting; the pneumatic spade for difficult hand digging; the power chain saw for tree removal; the electric saw for cutting up timber; a truck-mounted shredder for the removal of brush, branches, etc; the bulldozer or Angledozer for clearing operations; a trailer-type litter body

(*Concluded on next page*)

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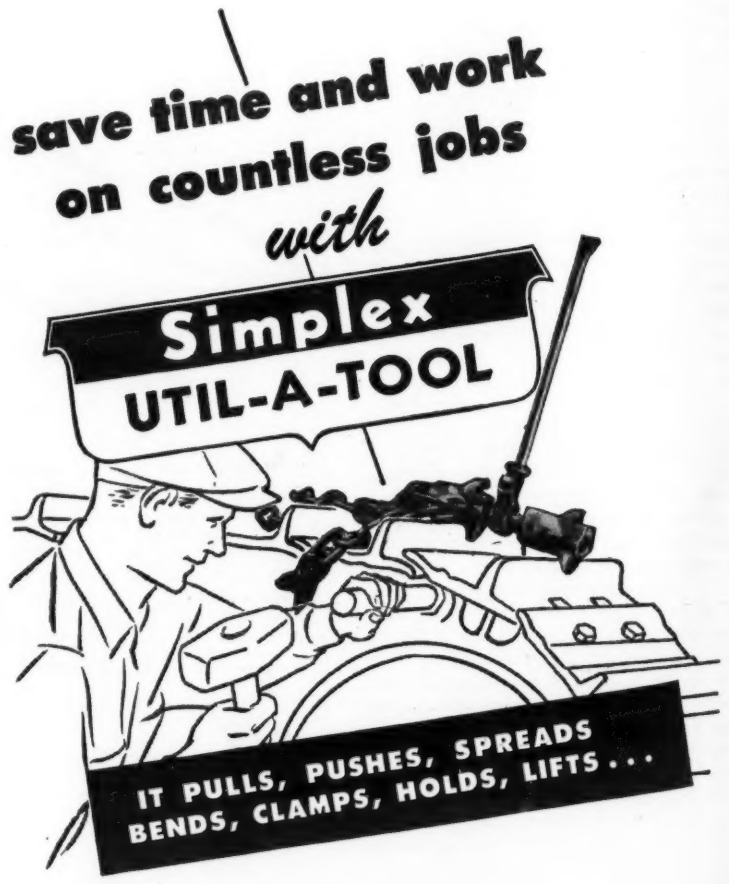

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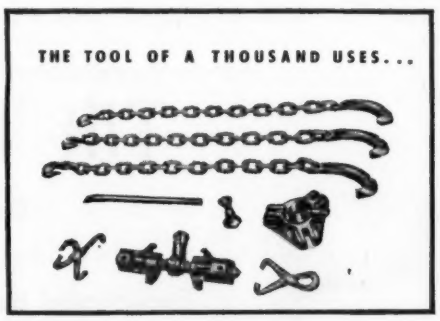

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Roadside Problems Discussed at Meeting

(Continued from preceding page)

equipped with a torch for getting rid of brush cuttings; a box drag for shoulder maintenance; power spray for weed control; and a combination seeder, rake, and roller. Mr. Shisler illustrated his talk with slides showing these various types of equipment in use in Ohio.

Right-of-Way and Land Use

The final session was opened by Murray D. Shaffer, recently appointed Director of Highways for Ohio. Mr. Shaffer brought the official greetings of the Department and spoke briefly of the importance of roadside development in the highway program, stressing particularly its utility values.

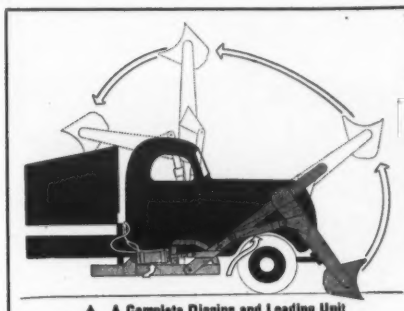
Frank H. Brant, Landscape Engineer, North Carolina Highway and Public Works Commission, presided at the final session. Its theme was the control of right-of-way, highway access, and adjacent areas. Mr. Brant pointed out that while the technical advances in roadside development are encouraging, enthusiasm must be tempered by the tough problem of right-of-way. It affects both design and operations, and all too often insufficient right-of-way has greatly restricted or changed the original plans.

The first speaker was Wilbur H. Simonson, Chief, Roadside Section, Public Roads Administration, who discussed land access and land use as elements in landscape design. Mr. Simonson pointed out that continuity in highway planning is helpful in coordinating land access and land use. He outlined the physical control features in highway design (climate, topography, structures, etc.). And he stressed the fact that safety requires some degree of land-use control. He stated that the concept of the road has broadened from that of a strip of pavement to the complete highway. It is therefore necessary, he said, to analyze the use requirements of both the project and the land through which it will pass; to study alternate possibilities; and then to select the solution in which all the factors are balanced. Liberal right-of-way will result in greater safety and reduced maintenance cost by providing the means of control.

"Right-of-Way Control in Relation to Economic and Legal Problems in Land Acquisition and Protection" was the subject of the paper presented by David R. Levin, Head, Special Administrative Studies, Public Roads Administration. Mr. Levin gave examples of legislation in various states which has to do with limited access and land-use control. He stated that the billboard problem results from lack of legislation and from poor administration, pointing out that in some states which have adequate laws, they are not enforced. He cited as an example of progressive right-of-way practice Ohio's reservation agreements. By these, areas along proposed new routes are reserved for a nominal sum; their use by owners is restricted to purposes not inconsistent with highway department plans. (See C.&E.M., Nov., 1946, pg. 26.) He concluded by stressing the necessity of thorough surveys of roadside conditions, as it is essential to have the facts before launching a program of roadside control.

The final paper in the Sixth Annual Short Course was by George B. Gordon, Landscape Architect, Public Roads Administration. Mr. Gordon discussed right-of-way control in relation to land conservation and management. Right-of-way width is the primary factor in roadside development, Mr. Gordon said; the time to buy sufficient width most economically is before a road is built. But unless a highway is properly located, he warned, roadside development is not justified as the highway is not permanent. Conservation, Mr. Gordon said, is the first and most important contribution the Landscape Engineer can make in highway development. The permanent features of the land are longer-lasting than anything built on it; these features, such as trees and vegetation, shore-line areas, fertile soil, pure water, must be conserved. Construction must aid in conservation, not create new problems. In discussing waysides and turn-outs, Mr. Gordon urged selecting only the best—and not too many—putting them into the plans for the highway, and conserving the natural features of the site.

Following Mr. Gordon, Professor Sutton made some closing remarks. He pointed out that the success of any such gathering depended upon the enthusiasm and participation of those attending, and invited suggestions for topics for discussion at the next Annual Short Course on Roadside Development.



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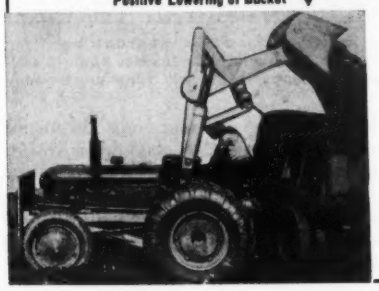

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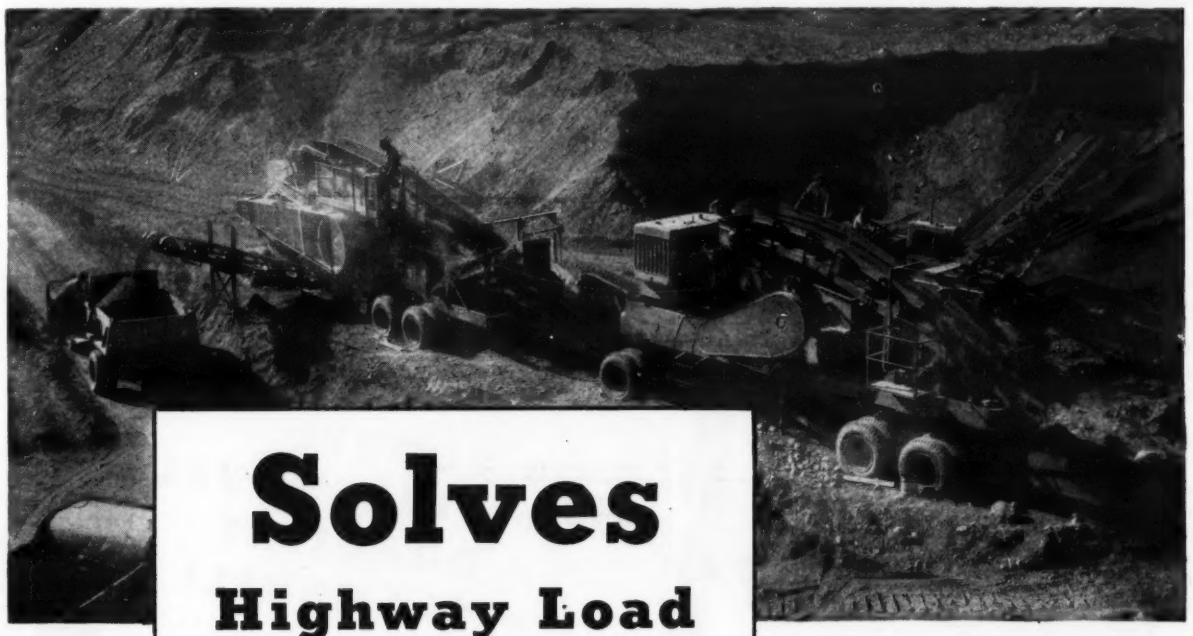

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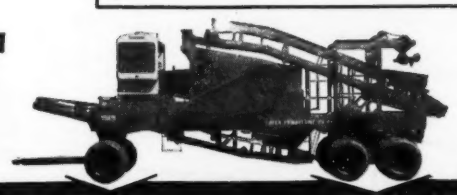

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The new Cedarapids portable primary and hammermill crushing plant is shown here in operation at Girard, Kans. This 40 x 33-inch hammermill is said to feature control of the finished product by size of grate openings. Its capacity is 120 tons per hour.

Portable Rock Plant

A new portable secondary rock-crushing and screening plant has been announced by the Iowa Mfg. Co., 916 No. 16th St., Cedar Rapids, Iowa. It uses the Cedarapids hammermill 3033 or 4033 which has a 180-degree grate area for high capacity, a 33-inch hammer-swing diameter, and spherical self-aligning bearings. The hammermill is designed to produce fine-quality uniform-size material at a high tonnage rate per hour.

The plant has a 30-inch reciprocating feeder, clutch-controlled, with an adjustable feed stroke. The charging hopper is 6 x 6 feet with an adjustable feed gate. Both feeder and hopper are detachable from the truck frame. The feed conveyor is 30 inches x 30 feet long, of the channel-frame type with lubricant-packed life-sealed bearings. The plant has a Cedarapids horizontal vibrating double-deck AG screen, 48 inches x 12 feet, with a feed box; the top deck is 14 feet long.

The portable power unit used in driving the hammermill features a GM Twin-6 engine, which consists of two 6-cylinder GM Series 17 diesel engines mounted together and driving a single shaft through a reduction gear box. Each engine of the GM Twin-6 has individual throttle and clutch controls. Power is furnished through a telescoping shaft which in turn drives the pulverizer by a series of V-belts. The power unit is mounted on a pneumatic-tired trailer. An auxiliary power unit mounted on a platform at the front of the hammermill plant furnishes energy for driving the screens and conveyors. The company recommends diesel or gasoline engines of the compact, high-speed type.

The rock-crushing plant is 8 feet wide and has a traveling length of 42 feet 2 inches, a traveling height of 12 feet 3 inches. The complete weight, less power unit, is 48,300 pounds.

Also made by the Iowa Mfg. Co. is a portable truck-loading bin. Standard size is 5 yards, but it is furnished in larger sizes if desired. The unit is mounted on a trailer which contains the bin, a gasoline engine, and a folding delivery conveyor. The trailer uses four 7.50 x 20 pneumatic tires. Traveling length is 16 feet, the width, 7 feet; either a 24 or 30-inch conveyor is available.

Further information may be secured from the company, or by using the enclosed Request Card. Circle No. 48.

I-H Holds Power Show

In conjunction with the Associated Equpment Distributors' convention in Chicago, the Industrial Power Division of International Harvester Co. held a power show at its Melrose Park, Ill., headquarters. On exhibit were all types of power and earth-moving equipment made by International Harvester, as well as machines of 32 other manufacturers for use on or powered by I-H equipment.

The show included a review of the exhibit, a luncheon, and a sales conference.

Trailer-Type Spreader

A spreader suitable for use with lime, cinders, calcium chloride, sand, and similar material is described in a broadside issued by the Portable Elevator Mfg. Co., Bloomington, Ill. The spreader is mounted on either cleated steel wheels or rubber-tired wheels, and is designed for attaching to a truck. It has a 16-foot spread.

The broadside contains a large photograph of the Little Giant spreader which points out the features of the unit and its method of operation and control. Also described are the improved wagon clamp, telescoping truck hitch, and slide-adjustment levers.

Copies of this literature may be obtained from the company. Or use the enclosed Red Request Card. Circle No. 87.

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Meat-Packing County Has a Hard Road Job

Cattle Trucks Entering Omaha Stockyards Travel County Roads; Wear Adds To Routine Problems

✦ AN important county of the United States is in Nebraska, situated on the great plains at the crossroads to the west. Douglas County has always been vital because so much of the nation's beef comes to Omaha's stockyards, to be distributed from there to the tables of America.

It comes by railroad and it comes by truck. And when it comes by truck it piles up at the great stockyards, and the trucks back up several miles on county roads. The maintenance of these heavily traveled thoroughfares is only one of the problems of Lou Adams, County Surveyor. His other headaches these days are floods on the Big Papillion River, which have destroyed several county bridges.

His problems also include weed and snow removal, the maintenance of now-old equipment in one central shop located within the city limits of Omaha, and maintenance of 664.25 miles of road.

A breakdown of this mileage by types shows that 54.28 miles are paved; 386.38 are built of graded and drained gravel; 54.53 miles are graded earth; and suburban surfaced additions total 98.78 miles.

For all its metropolitan flavor Douglas County is rural and its problems are rural. How to persuade a farmer, 10 miles out of Omaha, to plow furrows parallel to the county road is just one typical instance of a rural problem. How to convince him that field furrows at right angles to the county highways carry silt over the roads and fill up roadside ditches when Nebraska cloudbursts strike?

County Maintenance Program

Adams, working in cooperation with five county commissioners, directs all road maintenance through his ace trouble shooter and maintenance foreman Earl Whittaker. Patching and resurfacing of highways near Omaha is usually handled with creek gravel, cinders, or crushed rock. Several gravel pits are always handy to the roads in Douglas County. This material is generally removed by a bulldozer, or by one of the County's International TD-14 tractors with an 8-yard scraper. Some cinders treated with calcium chloride are stockpiled. This makes excellent material to spread when the roads are ice-blanketed in winter.

On the very heavily traveled county roads just out of Omaha, maintenance work has been about doubled by heavy-axle, high-frequency loads of stock trucks. The only way in which this situation can be handled is to grade these roads more often. Motor graders are sent onto them in the afternoons or on slack market days when the piled-up traffic has all gone into the stockyard.

C. & E. M. Photo
The automotive repair division of the Douglas County, Nebr., central shop is well equipped to repair the County's heavy trucks, as this picture shows.

Ditches are cleaned in spring and fall; the fall cleaning is designed primarily to remove weeds and to clean the shoulders, preparatory to a heavy snow-removal program in winter. Howling winds which sweep across Nebraska's plains in December and January come generally from the north and west. For this reason, a windrow

(Continued on next page)

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C. & E. M. Photo
Douglas County Maintenance Foreman Earl Whittaker looks over his stock of Wausau V-plows well in advance of winter's howling snowstorms.

Meat-Packing County Has a Hard Road Job

(Continued from preceding page)

of gravel is bladed over to the south or east sides of the road every October. On those sides the gravel will not favor the formation of snowdrifts, as it will when placed on the windward shoulder. Snow-plow operators always know just where this windrow can be found. So after the freeze-up they know they can operate at will on the other shoulder without tearing up their snow plows and truck equipment.

When these maintenance crews are sent out of Omaha, the machines are hauled to U. S. 30 west of the city. This is a sort of rendezvous point for all crews. They go back to this big transcontinental slab perhaps four to six times a shift. Foreman Earl Whittaker can find his crews by following U. S. 30 until he sees their "tracks"—in this case, fresh material from grading.

The only exception to this rule is in January and February, when about 21 Wausau and Sargent push and V-plows go out to clear the roads. Each operator then has a definitely scheduled route. Whittaker insists this route be followed. Winter storms are sometimes so severe that the plow digs out frozen-in automobiles. And the operators often rescue persons in great distress. There is no guesswork in Douglas County where the saving of a human life may be involved.

When snows start, the push plows go into action. Mounted on five big FWD trucks, on motor graders, tractors, and dump trucks, the plows work snow off to the ditch line. If a section shows a tendency to drift, and other routes will safely stay open for a few hours, Whittaker and Adams concentrate a group of the machines on the drift. In the dead of winter with snow riding in on the heels of a howling blizzard, these key men have stayed as long as 66 hours in a stretch, red-eyed and tense, fighting the silent whiteness hour after hour. It's a tough game for tough men and good operators.

Some of the farmers have it within their power to keep many of their access roads open themselves. For if about eight rows of corn are left standing along a highway, and these few rows are picked by hand instead of harvested with destructive mechanical pickers, they will serve very efficiently as a snow fence. By enlisting the aid of the Soil Conservation Service advisors, these county engineers and maintenance men have convinced an impressive number of farmers that they should leave those outside eight rows there. It saves the County the expenditure of funds for snow-fence erection.

The exodus of young farmer boys away from their old homes has caused a serious situation with regard to weed mowing in the summer. In the old days it was easy to hire a farmer's mower, with the farmer's son to run the machine. Many miles of right-of-way were mowed this way. That's not true any more. The boys are leaving the farms, going to the cities in search of fame, fortune, and fun. So until Douglas County can get some new mowers, the motor-grader blades are checking weed growth when they do fall ditch

(Continued on next page)

C. & E. M. Photo
Painters are at work on signs in the Douglas County central shop at Omaha, Nebr. The workman in the center is buffing old paint off a used sign that will be reclaimed.

HYDRAULIC HOSE ASSEMBLIES

HIGH AND MEDIUM PRESSURE
LOW PRESSURE

PERMANENTLY APPLIED PRESSED-ON COUPLINGS

REUSABLE COUPLINGS

ADAPTER UNIONS

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All hydraulic hose and fittings from regular stock. Catalog sent upon request.

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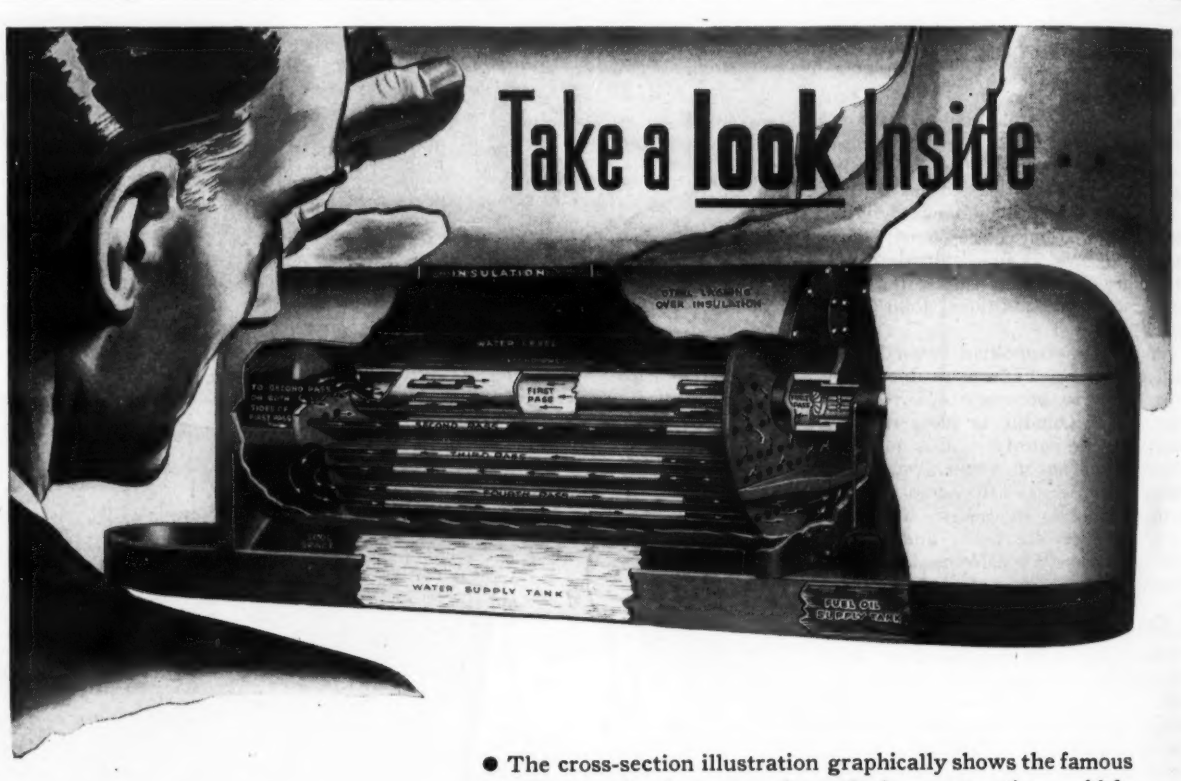
ANCHOR COUPLING CO., Inc.
342 N. Fourth Street, Libertyville, Illinois
FACTORY BRANCH
12303 Cloverdale Ave., Detroit 4, Michigan



. . to see why you get hot, dry steam faster with less fuel and water

• The cross-section illustration graphically shows the famous Cleaver-Brooks four-pass down-draft construction which, with integral oil-burner, accounts for the remarkable efficiency of Cleaver-Brooks steam generating equipment.

This construction doubles the lineal gas travel, compared to ordinary two-pass boilers,—the result is unmatched high heat transfer and efficiency.

No other equipment has this original and exclusive four-pass down-draft construction—plus the perfected positive dry coil method of condensate return—that's why you get hot, dry steam faster with less fuel and water with Cleaver-Brooks equipment. Write for bulletins and complete information.

CLEAVER-BROOKS COMPANY
5110 N. 33rd Street • Milwaukee 9, Wisconsin

Automatic Steam Plants
Completely self contained; highly efficient; require only simple piping connections to place in operation. Fully automatic fuel-oil burner; condensate recovery and feed water pumping system; no stack needed, sizes from 20 to 500 h.p.; pressures 15 to 200 lbs.

Hot Water Boosters
Oil-fired; fully automatic or manual operation; no licensed engineer needed; two capacity sizes: 3000 gals. storage tank for 1600 gals. of water heated 150° F. per hour; 1500 gals. storage tank for 800 gals. of water heated 150° F. per hour.

Portable Pumping Boosters
Heats bituminous material by direct firing in one operation, loading directly to distributor, relay truck or returning to tank car. Two sizes, truck mounting or 4-wheel trailer.

Portable Tank-Car Heaters
Available in 2 and 3 tank-car sizes. Oil-fired with exclusive four-pass flue travel; dry-coil steam condensate return under pressure — no water or heat loss. Provides a portable source of steam wherever needed.

Cleaver-Brooks

***Pioneers and Originators of* *TANK CAR HEATERS *BITUMINOUS BOOSTERS *AUTOMATIC STEAM-PLANTS**

Meat-Packing County Has a Hard Road Job

(*Continued from preceding page*)

cleaning.

Guy P. Dorsey, Deputy Surveyor, also has the job of bridge and culvert maintenance. This year the Big Papillion River went on a rampage three times, tearing out bridges that had long been built and in use. These structures are being replaced or repaired with timber, temporarily, when the County can buy it. When the budget can be upped beyond its present $475,000 a year, some permanent bridge work may be in the offing.

County Organization Funds

Douglas County is one of those subdivisions of a state where the office of county surveyor is elective. So Mr. Adams finds himself campaigning every four years, and in the meantime working with changing commissioners.

Funds for the budget come mainly from a registration and gasoline-tax apportionment from the state. But Douglas County is now in the position of losing about $250,000 of its proportionate gas-tax revenue each year, due to laws enacted by the State Legislature. The lawmakers have seen fit to route these funds to the large less populated counties in the western part of the state.

The County's share of matching funds for the new State-Federal Aid program for secondary roads is being raised by a tax levy. For many years, however, the County levied no special road tax. Purchasing is done by signed requisitions, which are turned over to a county purchasing agent. The hiring of all personnel is a joint arrangement among Adams, Whittaker, and a few of the foremen immediately concerned.

County Shop

Shortly after World War I in 1918, Douglas County allowed part of its County Hospital barn to be used by the County Road Department. It was a strange set-up. The first floor of the red brick building at 42nd and Pacific Streets in Omaha was well taken up by grunting hogs. Road-building equipment of early vintage was on the second floor, and the attic was filled with hay.

To make a long story short, the hay caught fire and reduced the height of the building. Eventually a new roof was put on and the entire building turned over to the road-maintenance forces.

As the building now stands, having had two additions and having been improved generally, it has ample space for working on all the county machines. The first floor has a tractor-repair shop with a solid concrete floor strong enough to take the biggest tractor. Motor graders are also serviced there. This first floor has a large space for materials and automobile storage, a blacksmith shop, and a sign and a welding shop.

The second floor, which is also accessible at street level from the back cinder apron, has a big parts-storage room with well cataloged bins for all equipment parts. The battery charger and machine-lathe equipment are also in this parts room. Other subdivisions of the second floor include a storage space and workroom for trucks, an automobile-parts room, and Earl Whittaker's office.

Many small parts not available from dealers are turned out on the 12-inch lathe, although the machine is old and "chatters" enough now to throw it off somewhat. Other activities include cutting the tops and bottoms out of worn-out hot-water boilers to use for culverts. These old metal cylinders come from Omaha junk dealers.

Tractor-track grousers are also built up regularly by cutting up worn-out motor-grader blades and welding strips of this material to the track plates. The tractor operators say the steel in a motor-grader blade is better than that used in most present-day grouser bars,

(*Concluded on next page*)

the FOOTE Kinetic mixer

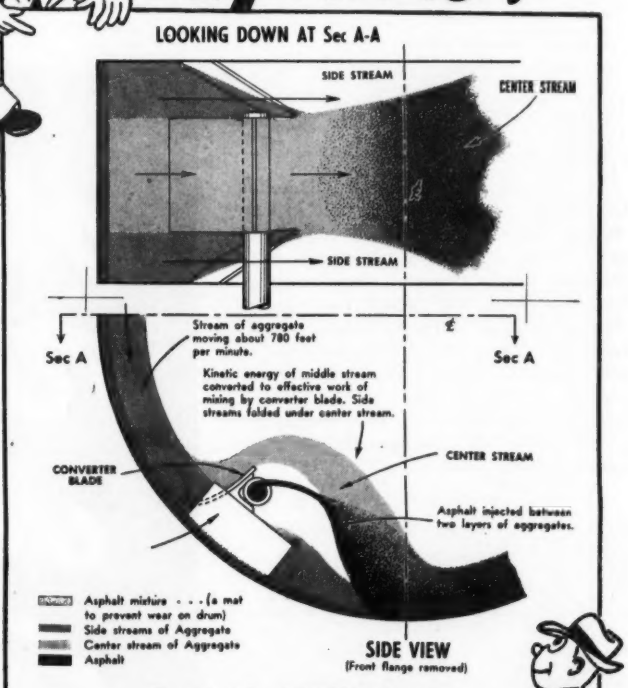
..the NEW MIXING PRINCIPLE that makes SMALL ASPHALT JOBS Profitable!

HERE'S how the new Foote Kinetic Mixer works — here's why this small, fully portable machine can handle any cold mix asphalt and produce 3 cubic feet of thoroughly mixed material in only 30 seconds!

Centrifugal force of revolving drum holds material against inside drum face. Linear travel stores up kinetic energy to do the work of mixing. Energy converter blade (see diagram) peels a stream of material off drum face, slowing speed of material, and creating powerful mixing action. Cross-mixing blades cause side-to-side mixing action. Asphalt is sprayed into material beyond converter blade in metered amounts—up to 8 gallons in 6 seconds. Every particle of aggregate gets complete, uniform asphalt coating—fast!

Ask your Foote Dealer for details on this new way to make any small asphalt job a real money-maker—or write direct for Bulletin K-100

THE FOOTE COMPANY, INC.
1916 State Street, Nunda, N. Y.


LOOKING DOWN AT Sec A-A
SIDE STREAM
CENTER STREAM
SIDE STREAM
Sec A
Sec A
Stream of aggregate moving about 780 feet per minute.
Kinetic energy of middle stream converted to effective work of mixing by converter blade. Side streams folded under center stream.
CENTER STREAM
CONVERTER BLADE
Asphalt injected between two layers of aggregates.
Asphalt mixture . . . (a mat to prevent wear on drum)
Side streams of Aggregate
Center stream of Aggregate
Asphalt
SIDE VIEW
(Front flange removed)

The principle of KINETIC MIXING
ALSO SEE PAGE 18

a thoroughly mixed batch every 30 seconds

5 seconds charging + 20 seconds mixing + 5 seconds discharging

10-TON CULVERT SECTIONS are "MADE TO ORDER" for this ROGERS TRAILER

The broad, sturdy deck of this Rogers trailer readily accommodated four huge culvert sections. This 40-ton load was swiftly and easily transported to the construction location.

Write for the catalog illustrating a complete range of sizes and types.

ROGERS BROTHERS CORPORATION
108 ORCHARD STREET ALBION, PENNA.

EXPERIENCE builds 'em PERFORMANCE sells 'em

Keep On

BUYING BONDS

★ ★ ★ ★

DON'T SKIMP!

Meat-Packing County Has a Hard Road Job

(*Continued from preceding page*)

and they can keep a tractor working longer on that account.

Following is a list of the small equipment used in different parts of the Douglas County shop:

Machine Shop

1 Black & Decker Super Service valve refacer
1 General-Electric Tungar battery charger
1 Buffalo junior drill press
1 workbench and vise
1 Sidney 12-inch machine lathe
1 Canedy-Otto drill press
1 Black & Decker grinder and brush

Tractor Shop

1 Weaver 5-ton chain hoist

Blacksmith Shop

1 Yale chain hoist
1 Wagner power grinder
1 bench vise
1 Wagner-electric-powered grinder
1 Canedy-Otto drill press
1 Wagner 10-hp motor for power
1 Little Giant trip hammer
1 power hacksaw
1 forge with Champion blower

Welding Shop

1 Lincoln welder
1 oxyacetylene outfit
1 DeVilbiss paint-spray outfit
1 grinder
1 Sterling vacuum heating pump

The battle with roads in Douglas County has always been hard. In Lou Adams' office hangs a tribute to Adams' work from no less a personage than Senator Hugh Butler. But however long his executive years have been, Adams' heart is still out in the field with his men. There is a little poem on his office wall, written by some anonymous author, to prove the point. Framed with care, and hung up in a prominent place where all visitors will see it, it goes something like this:

In Defense of Surveyors

It's true, I'll admit, that we oftentimes sit
And wait for a passing truck,
And we may wait too for the maintenance crew
To haul out a load of muck.
If the road isn't wide we may step aside
To let a big bus go through,
For there's always the chance it may crack up the gun
And spread out the transitman, too.

But there's other times, mister, we work till we blister,
And plug through the brush dripping wet,
As we stagger and lurch in a skeptical search
For a corner that's never been set.
The mosquitoes and ants bite us right through the pants
And bees make a play for our faces,
While berry vines scratch us and vine maples catch us
In private and personal places!

And we hang from a rope in the credulous hope
Of scaling the face of a quarry.
Where the least little slip of a foothold or grip
Will send us, unwilling, to glory.
And the sun burns our hide till it's wrinkled and dried
And our lips are so cracked we can't speak.
Why don't you try it, this "lazy man's diet"?
Christ, man, you'd be dead in a week!

Swiss-Made Calipers

A precision-made double caliper of Swiss manufacture is now being imported to this country by Park Sales Co., 417 Canal St., New York 13, N. Y. Known as the No. 17 Roch vernier caliper, it has a precision locking device and a capacity of 7 inches as standard size, with larger sizes also available if desired.

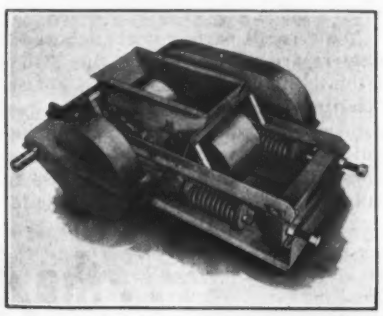
The all-purpose instrument combines outside and inside calipers with readings in metric and English scales, or with English only. Readings are to 1/1,000 inch.

Park Sales Co. also imports a micrometer with barrel readings to 1/1,000 inch and dial readings to 1/10,000 inch. This instrument has special indicators on the dial for use as a gage to check tolerances.

Further information may be secured from the company, or by using the enclosed Request Card. Circle No. 47.

Tampa Dealer for Hewitt

The Hewitt Rubber Division of Hewitt-Robins, Inc., Buffalo, N. Y., has appointed the Ellis & Lowe Co. as a new distributor for Hewitt's industrial rubber products in the Tampa, Fla., area. Ellis & Lowe was organized in April, 1944.



The Model 3219 roll crusher made by Acme Wire & Iron Works is a heavy-duty unit designed to handle any type of rock.

New Roll-Crusher

A heavy-duty roll crusher designed to handle any type of rock is manufactured by the Acme Wire & Iron Works, 1343 W. Laurel St., San Antonio, Texas.

The Model 3219 has roll shells which are 32 inches in diameter and 19 inches wide. The drive pulley can be placed on either side of the countershaft. The unit is constructed with a structural-steel base and frame, manganese-steel roll shells, and cast alloy-steel bearing housings. All shafts are SAE 4140, and the crusher employs new-style Timken bearings. All roll gears are encased and run continually in oil.

Further information may be secured from the company, or by using the enclosed Request Card. Circle No. 7.

Cable-Control Unit For Diesel Tractors

In order to provide a less expensive rear-mounted double-drum cable control for use with its D6 and D7 tractors, the Caterpillar Tractor Co., Peoria, Ill., is now producing a new model designated the No. 23. It is designed for use with scrapers, bulldozers, and rippers.

The drum diameter is 9 inches, and its capacity is 150 feet of ½-inch cable. Line speeds are: bare drum, 364 fpm for the D6 model, and 332 fpm for the D7 model; full drum, 588 and 536 fpm, respectively. It has metallic clutch facings and molded brake linings.

Further information may be secured from the company, or by using the enclosed Request Card. Circle No. 29.

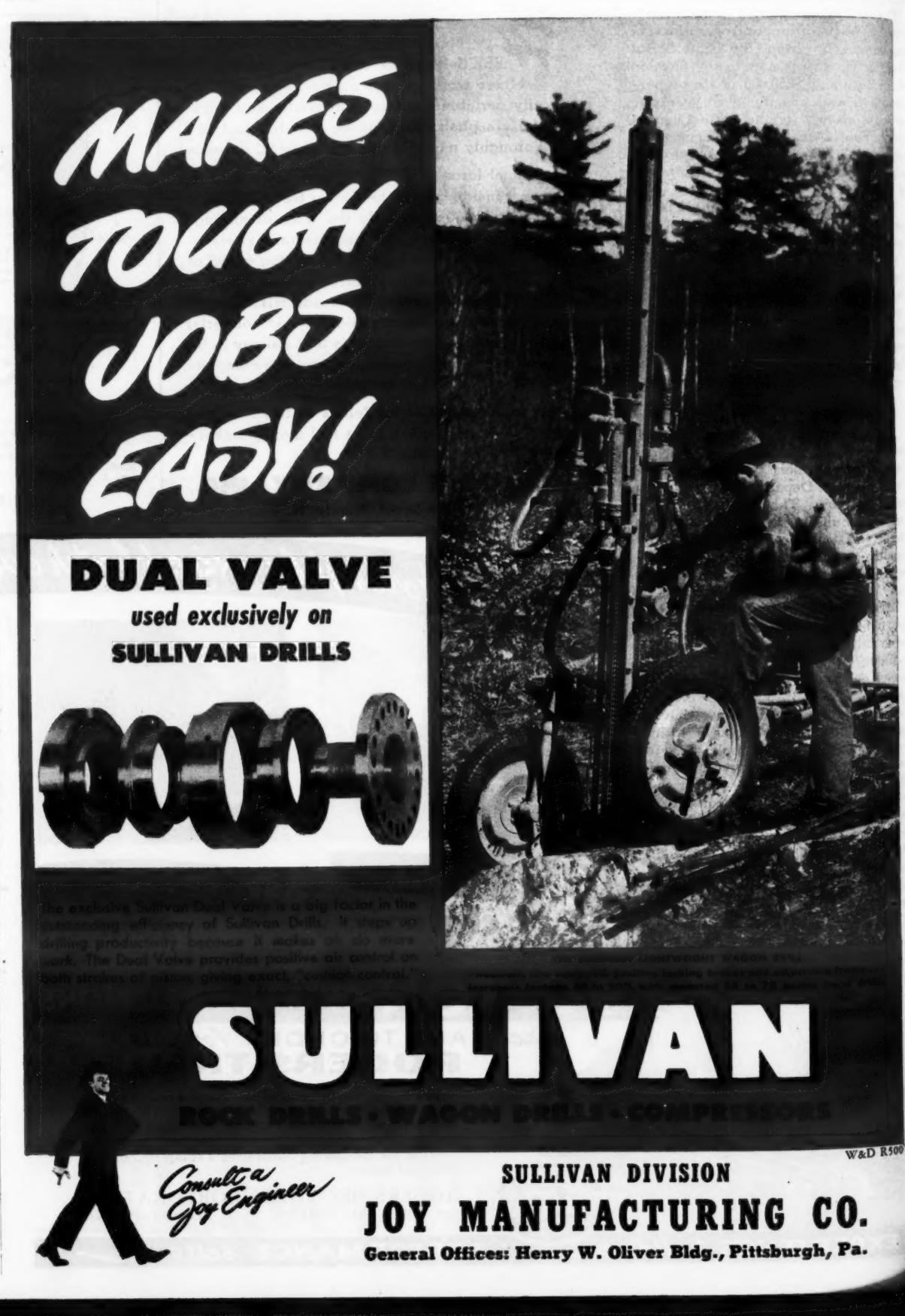
Mobile Pavement Breakers

Descriptive literature on its line of pavement-breaker machines is available for the asking from the R. P. B. Corp., 1517 Santa Fe Ave., Los Angeles, Calif. These are made in truck-mounted or trailer-mounted models which feature a pneumatic-controlled blow.

The broadside discusses the heavy-duty truck-mounted model, the trailer-mounted junior Models M and H (the latter can also be used horizontally), the junior Model T, and a hammer assembly for mounting on a power shovel.

Complete specifications are listed, including truck requirements, compressor requirements and weights of hammers.

Copies of this literature may be obtained from the company. Or use the enclosed Red Request Card. Circle No. 79.



C. & E. M. Photo
Concrete for Arute Bros. Baldwin Avenue bridge was mixed for 1½ minutes in a Ransome 27-E paver. Then it was discharged into a Blaw-Knox 1-yard concrete bucket to be swung over the forms by a Lorain truck crane.

New Concrete Span

(Continued from page 1)

rus-Erie crane. The earth in this area is composed of loam, red sand, gravel, and cobbles. The footings are founded on gravel. They were poured 3 feet deep with the pier 16 feet wide and the abutments 8 feet wide.

Forms for the substructure were made from ⅝-inch plywood for the exposed faces; they were made of random widths of 1-inch stock on the inside where the backfill was later placed. The studding was done with 2 x 6's on 12-inch centers, with double 2 x 6's for wales varying from 2 to 3 feet on centers. Both Williams and Richmond tie screws were used to pull the forms together and hold them in place at the proper spacing. These went through the wales usually at 3-foot intervals.

As on all arch bridges, the most interesting aspect of form work, and the one requiring the greatest amount of time and material, was the building of forms for the slab and falsework to support them. To support each arch 7 bents were built with 13 posts to a bent. At the center where the arch is 18 inches thick the bents were spaced 7 feet apart with the posts resting on timber mud sills. Near the ends where the arch increases in thickness to 3 feet at the spring line, the bents were placed closer together on 3-foot centers; and the posts were set on concrete sills because of the heavier loading.

The log posts varied from 10 to 12 inches in diameter, with an average length of 18 feet. They were capped with 12 x 12's across which 6 x 12 stringers were placed. Stringer spacing varied from 2 feet on the outside of the bridge, where the heavier loads were met because of the railing pours, to 4½ feet at the center. On top of the stringers 2 x 6 posts were set vertically, with their height varying to the curve of the arch. Across their tops 2 x 10's were laid flat to act as ribs. To these ribs 3 x 8 joists were nailed on 12-inch centers to which the ⅝-inch plywood was fastened. With this sturdy construction, no settlement was observed at any point of the arch after the deck pour.

Concreting

A concrete batch plant for both bridges being built by the contractor was set up near the East Main Street bridge site; this is about a mile south of the Baldwin Avenue project. The plant consisted of a Blaw-Knox 100-ton 3-compartment bin, one for the sand and the other two for the different grades of stone used in the coarse aggregate, and a Blaw-Knox 300-barrel cement bin. The aggregate was delivered to the plant by trucks. Sand was supplied by the Meriden Washed Sand & Gravel Co., and the stone from the York Hill Trap Rock Co.; both hauls were under 4 miles.

The cement was shipped in bulk from the plant of the Lone Star Cement Co. at Hudson, N. Y., to a siding of the New Haven Railroad at Berlin, Conn. There it was unloaded and hauled 6 miles to the storage bin. The siding was high enough in the air so that the cement-hauling truck, a Ford with a special body of 40-barrel capacity, could be filled with ease. At the plant the truck dumped the cement into a hopper from where it was raised to the bin by a 40-foot enclosed elevator.

From the stockpiles of sand and stone the bins were filled by the Bucyrus-Erie crane equipped with a Williams ¾-yard rehandling clamshell bucket. Three Ford trucks, carrying two batches each, hauled the materials a mile to the Ransome 27-E paver where

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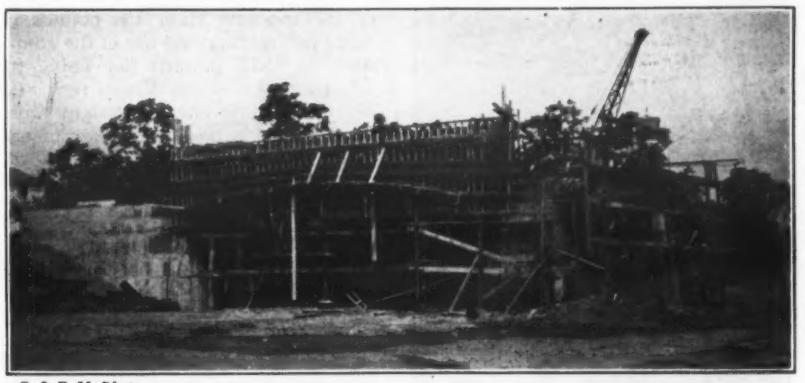
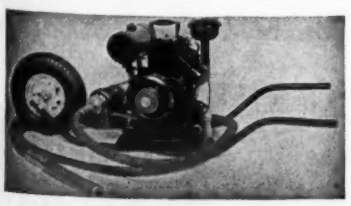
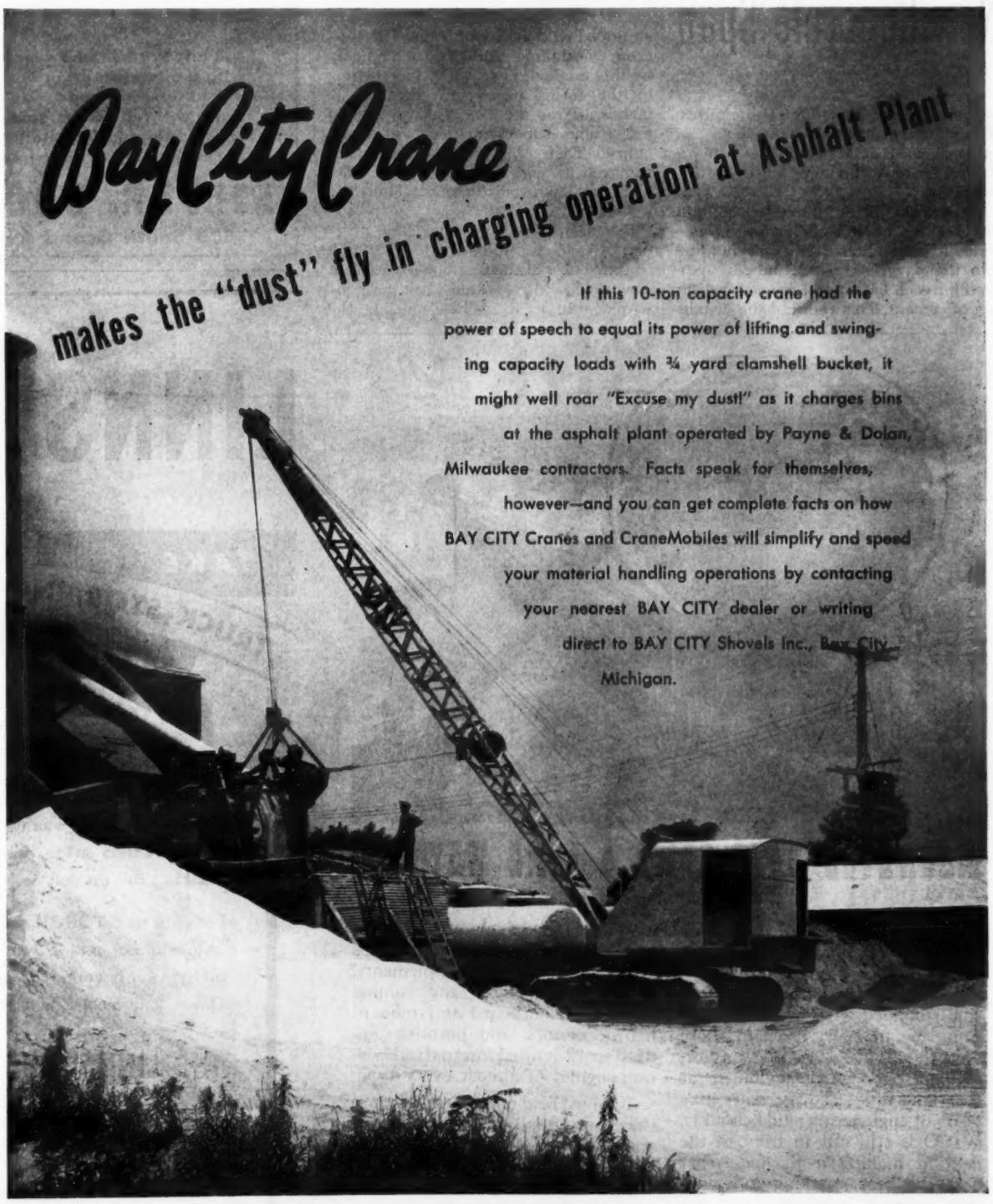


C. & E. M. Photo
This southwest view of the Baldwin Avenue grade separation on the Wilbur Cross Parkway shows falsework for the arch and form work for the south frame face. Arute Bros. held this $89,300 contract with the Connecticut State Highway Department.



Complete line of
gasoline, pneumatic and electric driven
concrete vibrators and grinders
Write for information and prices
ROETH VIBRATOR COMPANY
1737 Farragut Ave. Chicago, Ill.


Bay City Crane
makes the "dust" fly in charging operation at Asphalt Plant
If this 10-ton capacity crane had the power of speech to equal its power of lifting and swinging capacity loads with ¾ yard clamshell bucket, it might well roar "Excuse my dust!" as it charges bins at the asphalt plant operated by Payne & Dolan, Milwaukee contractors. Facts speak for themselves, however—and you can get complete facts on how BAY CITY Cranes and CraneMobiles will simplify and speed your material handling operations by contacting your nearest BAY CITY dealer or writing direct to BAY CITY Shovels Inc., Bay City, Michigan.
BAY CITY
SHOVELS • DRAGLINES
CRANES • HOES • CLAMSHELLS
SEE YOUR NEAREST DEALER for Bay City excavating and material handling equipment in sizes from ⅜ to 1¼ yards having crane rating up to 20 tons. Both crawler and pneumatic tire mounting.

C. & E. M. Photo
Pieces of plywood 3 feet square were used as guide boards for pouring concrete at the top of 12-inch-wide step forms, on the Baldwin Avenue twin rigid-frame grade separation.

New Concrete Span

(*Continued from preceding page*)

the concrete was mixed for 1½ minutes. Water for the mix was pumped to the paver from the adjacent brook by a Barnes triplex high-pressure 2-inch pump.

To entrain air in the concrete and thus seal up the voids, Vinsol resin was added to each batch after it was dumped into the paver skip. Six ounces were used for each batch, or 1 ounce for each bag of cement. This reduced the weight of the concrete from 158 pounds per cubic foot without the use of the admixture, to 155.5 pounds per cubic foot when mixed with the Vinsol resin. This 2½-pound difference in weight represented a 1.6 percentage of air in each cubic foot of concrete. The weight of a typical 6-bag batch of concrete was as follows:

Cement	564 lbs.
Sand	1,200 lbs.
½-inch stone	700 lbs.
1¼-inch stone	1,300 lbs.
	3,764 lbs.

An average of 33 gallons of water was added to the dry weights of each batch. The gradation of the ½-inch and 1¼-inch stone is as follows:

Sieve Size	Per Cent Passing 1¼-Inch Stone	Per Cent Passing ½-Inch Stone
1¼-inch	100	.....
1½-inch	95-100	.....
1-inch	35-70	.....
¾-inch	0-25	.....
½-inch	0-5	100
⅜-inch	.....	30-60
No. 4	.....	0-15
No. 8	.....	0-5

After the concrete was mixed it was discharged into a Blaw-Knox 1-yard concrete bucket. This was swung over the forms by a Lorain truck crane equipped with a 45-foot boom. The concrete was dumped smoothly and quickly by this method, even when the opening of the forms narrowed down to 12 inches as was the case when a step in the frame superstructure was being poured. Then a piece of plywood, 3 feet square, was held against the side of the form being poured to act as a chute for the concrete.

Because of the thin walls, concentration of steel, and the step sides in these frame pours, depositing concrete was a slow process; it required about an hour to place 10 yards. When pouring the slab, this rate was increased to an average of 30 yards per hour in the increased working area and with the greater volume of concrete to be placed. As the concrete was dumped it was vibrated with a Mall vibrator.

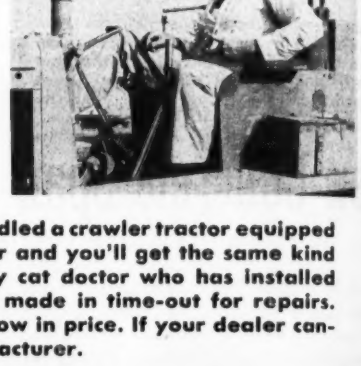
The reinforcing steel was procured from the Bethlehem Steel Co. which shipped it by rail from its plant at Sparrows Point, Md., to a siding of the New Haven Railroad at Meriden. Here it was unloaded by the truck cranes and hauled to the job site.

Wet burlap was used in curing the concrete. The top of the arch slab was

(*Concluded on next page, Col. 2*)

JOHN POETKER *Says about*
SILVER STEERING BOOSTER

"I can't say too much for this booster. I have been angle dozing all day without my arms getting tired. If they ever take it off it will be over my dead body." Tractor is owned by the City of Azusa, California.



Ask any skinner who ever handled a crawler tractor equipped with a Silver Steering Booster and you'll get the same kind of enthusiastic approval. Any cat doctor who has installed them will tell of the savings made in time-out for repairs. Easily and quickly installed, low in price. If your dealer cannot supply you write to manufacturer.

SILVER BOOSTER MFG. CO.
1400 South Grand Ave., Los Angeles 15, California

MAGNETOS HAVE COME A LONG WAY, TOO

At the turn of the century gasoline engines of all kinds were sparked by Witherbee Igniters, shown at top, invented by Thomas Witherbee who founded the Wico Electric Company in 1897. Even in those days the problem was to get a hot, regular spark to the cylinders at the right times. Today, with fifty years of engineering skill behind it, WICO is still out in front of the field in making a magneto that does the best sparking job, with the greatest reliability, at the lowest cost.

WICO engineers concentrate their attention on making ever better magnetos and the postwar "X" models are the last word in "igniters" built to 1947 aircraft standards. The world's largest manufacturer of magnetos exclusively, WICO equips America's aristocrats in farm implements, contractors', oilfield and mining equipment, outboard and inboard marine motors, and portable and fixed spark-ignited internal combustion engines of almost every type.

Trained field engineers and more than a thousand authorized service stations sell WICOs and serve buyers and users everywhere. Wico Electric Company, West Springfield, Massachusetts.

WICO MAGNETO 50 YEARS OF DEPENDABLE IGNITION

LINNS

TAKE TRUCK-STOPPING FOOTING IN STRIDE

Here is a LINN owned by the STURM & DILLARD CONSTRUCTION COMPANY moving a *heavy* payload over truck stopping terrain . . . a railroad relocation job that requires all weather equipment . . . a natural for the LINN HAFTRAK.

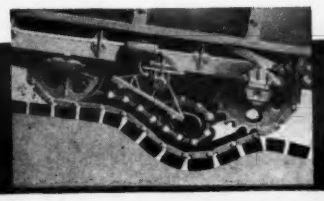
The LINN *flexible* traction unit fits itself to the footing on any job—it follows the terrain contour, biting in to give maximum traction over rocks, mud, clay, stumps, ice, snow or severe grades. The tracks are extremely wide, insuring adequate traction and preventing "sinking in" on soft or boggy ground.

For your next TOUGH contracting job try a LINN for haulage. Available with capacities from 5 to 50 tons in a variety of body styles for all types of work. For specifications write to our General Sales Office, 250 West 57th Street, New York 19, N.Y.

THE LINN MANUFACTURING CORPORATION
MORRIS, N. Y.

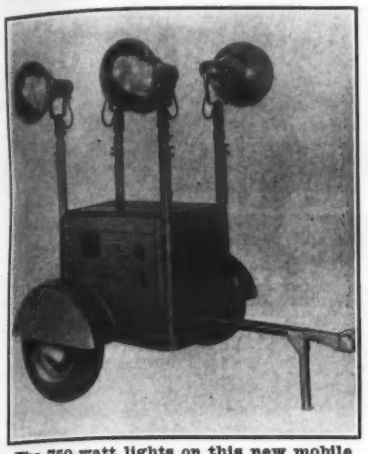
Manufacturers of Haftraks for over 30 Years

LINN HAFTRAK



CONTOUR TRACTION

BUY *all the Bonds you can . . .* KEEP *all the Bonds you buy*



The 750-watt lights on this new mobile Onan Floodlighter are mounted on steel standards that can be raised 7 feet and that swing a full 360 degrees horizontally.

Mobile Floodlights

A mobile floodlighter for night construction jobs is made by D. W. Onan & Sons, Inc., 43 Royalston Ave., Minneapolis, Minn. Completely self-contained, the new Onan light unit is housed in sheet metal. It is claimed by the company that the unit is one-man-operated, and can be hitched to any car or truck and towed safely at high speeds.

The Floodlighter assembly consists of an Onan 3,000-watt ac electric plant, plus four floodlights. The 750-watt lights are mounted on steel standards that can be raised to a height of 7 feet, and which swing a full 360 degrees horizontally with a wide vertical arc. Each floodlight is operated by a separate toggle switch.

The prime mover for the generator is an air-cooled Onan 4-cycle 2-cylinder gasoline engine. The Floodlighter has electric push-button starting, and the generating unit provides a dc output for recharging the two heavy-duty starting batteries. Four receptacles are available for operating auxiliary lights or electric tools. The unit is said to require 0.183 gallon of gasoline per kilowatt hour at full rated load.

Further information may be secured from the company, or by using the enclosed Request Card. Circle No. 46.

Joint-Sealing Machine

A catalog on the Blankner pavement joint and crack-sealing machine is now being distributed by Duggan's Inc., 206 Auditorium Bldg., Cleveland 14, Ohio. This machine is designed to heat bituminous materials to controlled temperature, and pour the hot contents into expansion and contraction joints and cracks.

The catalog describes the various parts of the unit, which consists of a two-wheel chassis on which is mounted a 25-gallon flue-type kettle with ring-type burners for heating the bitumen. Its features of construction and operation, its specifications, and its applications are covered. Instructions are provided for joint maintenance and for operating the unit. A large two-page spread is devoted to illustrating and listing the parts of the unit and numbers for ordering.

Copies of this literature may be obtained from the company. Or use the enclosed Red Request Card. Circle No. 66.

B-G Dealer in N. Dak.

The appointment of a dealer for the state of North Dakota has been announced by the Barber-Greene Co., Aurora, Ill. The new dealer, Smith, Inc., of Fargo, will be exclusive distributor in the state, representing the Barber-Greene construction and industrial divisions. The company is under the direction of Donald A. Smith, President, and Charles Beck, Sales Manager.

New Concrete Span

(Continued from preceding page)

later waterproofed with three plies of fabric coated on both sides with Koppers membrane waterproof paint which was also applied to the concrete. This was covered with a 2-inch layer of mortar reinforced with wire mesh.

Over this went a 2-foot fill as a foundation for the Baldwin Avenue pavement. Material for this cover and for the backfill around the abutments was obtained from the East Main Street bridge job; it was excavated there by the 2-yard shovel and hauled to the Baldwin Avenue site by a fleet of six Mack trucks holding from 7 to 8 yards each.

Quantities and Personnel

The major items of the contract, including both the bridge and culvert construction, were as follows:

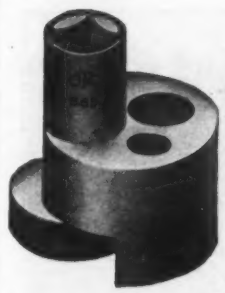
Excavation	1,000 cu. yds.
Reinforcing steel	159,009 lbs.
Concrete	1,945 cu. yds.
Membrane waterproofing	450 sq. yds.

A force of 24 men on the average was employed on the Baldwin Avenue job working a 48-hour week. To comply with insurance regulations in the state of Connecticut, the contractor dispensed approved and tested drinking water to his men in covered metal containers, and provided Hygeia paper cups.

For Arute Bros., Inc., William Boyd was Superintendent, assisted by Jim Adams. C. C. Robinson was Inspector on the project which is located in the residency of E. S. Lawler, Resident Engineer, with headquarters at New Haven. L. J. Conaty is Assistant Resident Engineer. The Department is headed by William J. Cox, Commissioner, with Arthur W. Bushell, Deputy Commissioner and Chief Engineer. Leslie G. Sumner is Director of Engineering and Construction.

A New Stud Puller

A new OTC stud puller said to feature a wide range of capacity has been announced by the Owatonna Tool Co.,

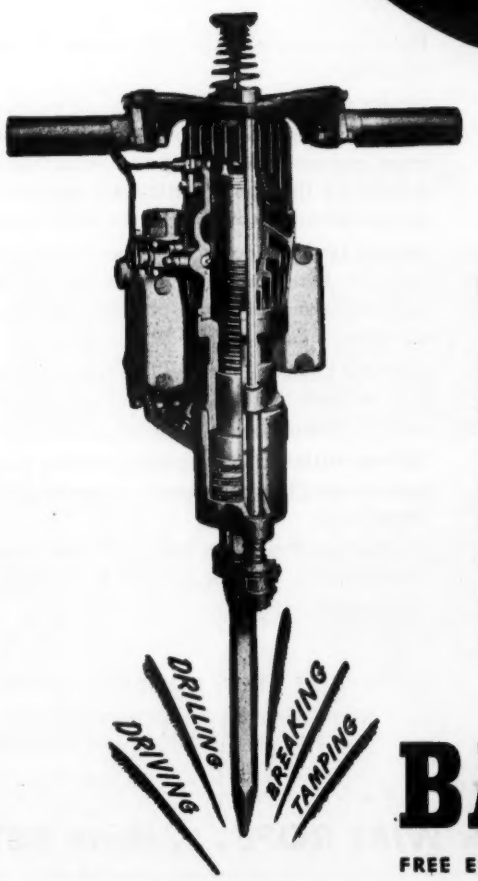


The new OTC wide-range-capacity stud puller will take studs from ¼ to ⅝ inch in diameter.

348 Cedar St., Owatonna, Minn. The No. 865 puller is designed to take studs from ¼ to ¾ inch in diameter, and can be used with any ½-inch drive-socket handle.

The knurled wheel is held in place with a compression ball and spring; it can be easily removed and replaced, the manufacturer says, so that a new wheel may be installed when the old one wears out.

Further information may be secured from the company, or by using the enclosed Request Card. Circle No. 45.



ON A THOUSAND AND ONE JOBS!

The all-around usefulness of Barco is lifting this Portable Hammer's popularity to new heights. Breaking, drilling, driving, tamping—there's almost no limit to the range of jobs Barco can do. Barco is easy to handle, easy to maintain and mighty difficult to do without. Send for complete details. Barco Manufacturing Co., Not Inc., 1818 Winnemac Avenue, Chicago 40, Illinois. In Canada: The Holden Co., Ltd., Montreal, Canada.

BARCO PORTABLE GASOLINE HAMMERS

FREE ENTERPRISE — THE CORNERSTONE OF AMERICAN PROSPERITY

The Tips saw, mounted on a wheel tractor, here has its blade in horizontal position for land clearing.

Tractor-Mounted Saw

A tractor-mounted saw that is designed to fell brush, shrubs, and small trees is manufactured by the Tips Engine Works, P. O. Box 896, 300 Baylor St., Austin 5, Texas. The Tips saw is said to be readily and easily mounted on most wheel tractors of 20 belt hp or more.

Blades for the saw come in two standard sizes, 48 and 60 inches in diameter. It is claimed that trees of 4 inches or less can be cut while the tractor is moving forward in low gear. Trees of greater diameter up to and including 26 inches can be felled with a 60-inch blade with the tractor in a stationary position. However, trees of larger diameter are felled by making two or more approaches with the unit.

Although the saw is normally operated in a horizontal position for land clearing, a universal joint in the drive shaft permits a 22½-degree range of movement forward or backward, and an elevation from ground level of 28 inches. With the application of this ball-bearing universal joint, the manufacturer has been able to expand the use of the crosscut saw blade stabilizer for cutting up felled logs, etc.

Further information may be secured from the company, or by using the enclosed Request Card. Circle No. 44.

Electric Vulcanizer

Of interest to shop maintenance men concerned with tube repairs is a new electric vulcanizer manufactured by the J. W. Speaker Corp., 3059 No. Weil St., Milwaukee 12, Wis. It is claimed that after the lever and the time control of the Speaker Electromatic are set, the machine will automatically apply an Electro-Patch or replacement valve under the proper pressure and the correct heat for vulcanization. Electromatic timing is variable up to 15 minutes.

Electromatic vulcanizers are available for 25 to 50 or 50 to 60-cycle 110-volt ac, and for 50 to 60-cycle 220, 230, and 250-volt ac.

Further information may be secured from the company, or by using the enclosed Request Card. Circle No. 42.

Palmer Dies in New York

The death of Arthur E. Palmer in New York City was announced by Caterpillar Tractor Co. of Peoria. Mr. Palmer joined the company in 1936, and since 1937 had been a field representative for the Engine Sales Department.

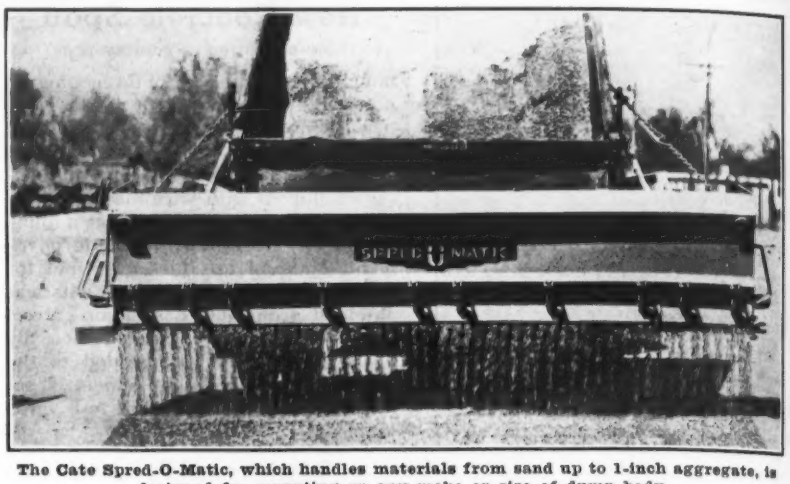
Dump-Truck Spreader

A truck-mounted spreader for seal coating, ice control, handling fertilizer, etc., is made by the S. L. Cate Co., 49 E. Ninth South St., Salt Lake City 4, Utah. It is said to handle sand or other material up to 1-inch aggregate. Universal brackets permit mounting, without alterations, on any type, size, or make of dump body, the company says.

The Spred-O-Matic is driven by a friction-drive rubber-covered wheel in contact with the rear wheel of the truck. This driving power is then transmitted through roller chains to an automatic reversing transmission, equipped with a cab-controlled throw-out mechanism for ice control, and thence to the feed worm.

The gate opening is controlled by a single lever on the end of the spreader. Automatic ejection of oversize is accomplished through the use of a heavy spiraled feed worm which ejects through spring-loaded gates. The spreader is made in 9 or 10-foot widths. Blank-out gates are used to control widths of spread. It is also possible to control poundage or depth per square yard.

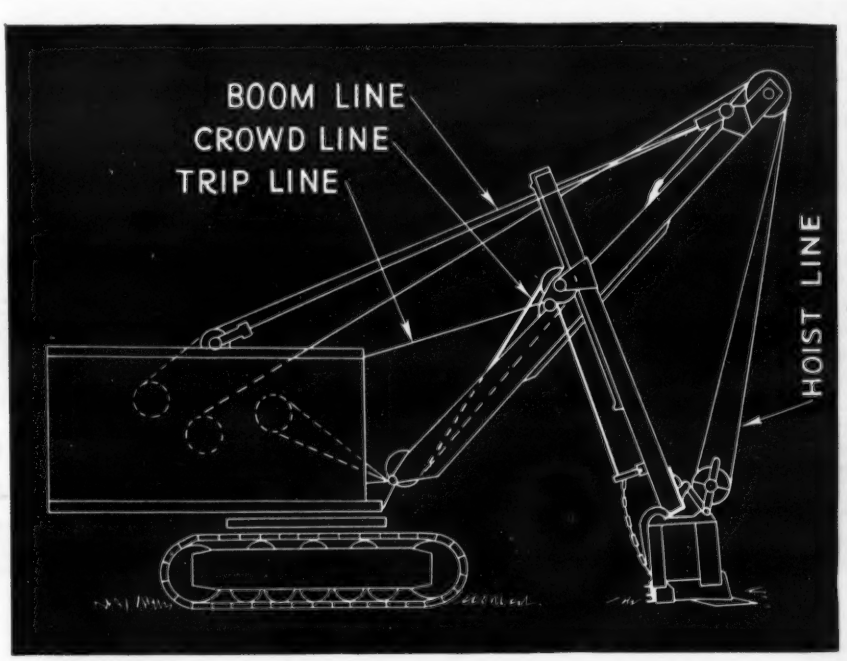
Further information may be secured from the company, or by using the enclosed Request Card. Circle No. 41.

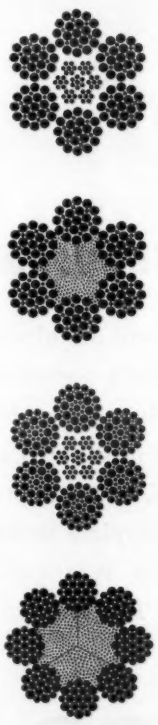


The Cate Spred-O-Matic, which handles materials from sand up to 1-inch aggregate, is designed for mounting on any make or size of dump body.

COMPLETE
WELL POINT SYSTEMS
WILL DRY UP ANY EXCAVATION
Faster—More Economically
Write for Job Estimate and Literature
COMPLETE
MACHINERY & EQUIPMENT CO., Inc.
Dept. C
36-40 11th St., Long Island City, N.Y.
Tel. IRonsides 6-8600

Things to know in buying
Ropes for Power Shovels





Here are several important points to consider when you plan to rerig power shovels:

HOIST LINES must stand up under severe bending. They encounter some wear and are subjected to unusually heavy shock loads. For this service one of the most commonly-used ropes in diameters up to 1⅜ in. is a Bethlehem Purple Strand 6 x 19 Type W, with lang lay and independent wire rope core. The Form-Set (preformed) construction is widely specified.

BOOM LINES are more or less stationary. With little movement, there is little wear. A Bethlehem Purple Strand 6 x 19 Type W rope, with regular lay and independent wire rope or fiber core, is a popular choice. Lang lay is also commonly used.

CROWD LINES encounter bending, crushing, and wear. Purple Strand Form-Set 6 x 19 Type W with lang lay and independent wire rope core gives excellent service. Some shovels require 6 x 37 flexibility.

TRIP or DUMP LINES experience little wear. 8 x 19 plow steel, fiber core, regular lay, is usually satisfactory on small shovels; 6 x 19 Type W is preferable on large ones.

In cases of doubt, we strongly recommend that you consult a Bethlehem field engineer. It's part of his job to help you select the *right* wire rope for your equipment.

BETHLEHEM STEEL COMPANY, BETHLEHEM, PA.
On the Pacific Coast Bethlehem products are sold by Bethlehem Pacific Coast Steel Corporation

When you think WIRE ROPE . . . think BETHLEHEM

ARBA Convention

(*Continued from page* 1)

Public Works Committee and Chairman of the House Subcommittee on Roads, pointed out that road-building activities throughout the country during the past year were retarded by unsettled economic conditions, high prices, shortages of labor, materials, and equipment. Many important projects were deferred because of unfavorable conditions, he reminded his listeners.

Representative Cunningham said: "Briefly, the objectives of the current program are threefold: to modernize and improve existing routes in the Federal-Aid system, to develop over a period of years a national interstate highway system including arterial thoroughfares in urban areas, and to designate in each state a system of secondary roads and begin improvement with Federal Aid."

Resolutions Adopted

Recognizing the present labor situation as important to the national highway program, the ARBA adopted a new resolution. This urges Congress to enact laws providing that labor unions carry the same contractual obligations as those required of the highway construction industry. Legislation acceptable to the ARBA resolution would provide that unions submit an annual financial statement, open for public inspection. It would prohibit the unionization of supervisory employees, secondary boycotts, and jurisdictional strikes.

Belonging to a union would no longer be a prerequisite to employment, and no employer would be required to discharge, suspend, or penalize any employee for not joining or maintaining membership in any union.

The ARBA also adopted a resolution which pledges support to the Apprentice Training Program of the various Governmental agencies, the Associated General Contractors of America, and the American Society of Civil Engineers. A separate resolution urges a comprehensive nationwide campaign to create favorable support for upgrading present salary ranges for engineers in state, county, and city highway departments.

New Officers Elected

J. T. Callaway, Goodyear Tire & Rubber Co., Chicago, was named President of the ARBA for 1947. He succeeds James J. Skelly of Media, Pa., who has headed the organization for the past two years.

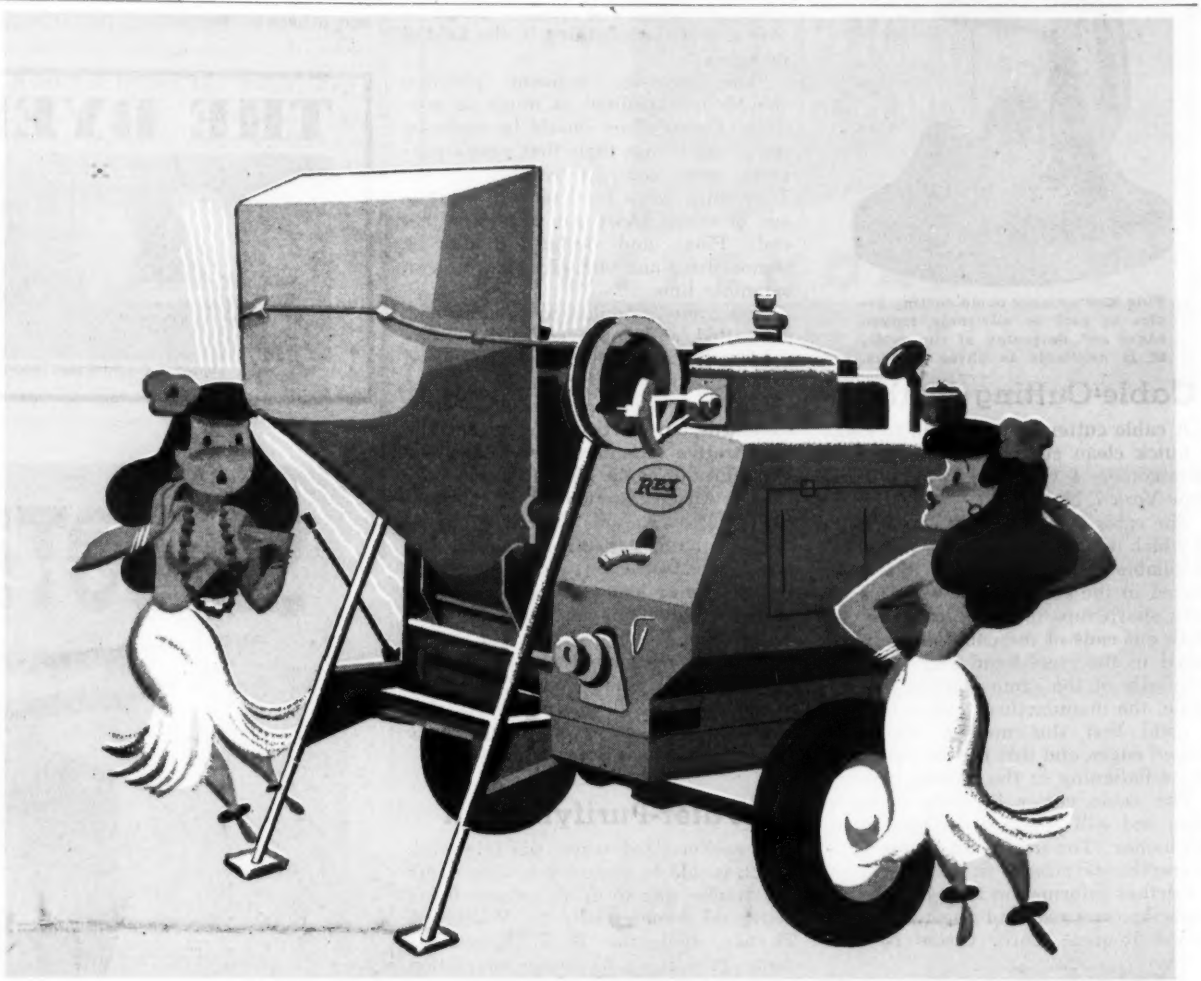
For Vice President of the Northeastern District, Paul B. Reinhold of Pittsburgh, Pa., succeeds himself. Charles W. Smith of Pensacola, Fla., replaces Alex F. Hancock as Vice President of the Southern District. W. A. Roberts of Milwaukee succeeds E. R. Galvin as Vice President of the Central District, and Robert A. Allen, Nevada State Highway Engineer, was re-elected Vice President of the Western District.

Directors for a three-year term expiring in 1950 include James C. Alban of Baltimore; Perry T. Ford of Columbus, Ohio; Frederick Hoitt of Boston; E. R. Needles of New York; C. W. Phillips of Nashville, Tenn.; Walter Toebe of Lansing, Mich.; and Charles M. Upham of Washington, D.C. Hoitt, Alban, and Upham succeed themselves as directors. Herbert C. Whitehurst of Washington, D.C., was returned as the Association's Treasurer.

Important Subjects Discussed

Various papers on the wide variety of subjects and problems which confront all phases of the road-building industry today were presented on the program. Discussing the status of the Federal-Aid secondary program, Deputy Commissioner H. E. Hilts of the Public Roads Administration pointed out that good progress was made during 1946 in spite of difficulties. But he urged a continuation of excellent teamwork between Federal, state,

(*Concluded on next page, Col.* 2)



"Wish we could 'shimmy' like that Rex Skip"

The Rex "Shimmy Skip" is in a class by itself when it comes to getting the batch into the drum faster! You don't have to pound it to get all the batch to drop. The "Shimmy Skip" provides just the right amount of snappy, shaking action . . . 304 sharp impacts per minute . . . for a clean, quick, time-saving charge that adds up to more batches per day . . . more yards per job . . . more profit for you.

The Rex "Shimmy Skip" is actuated by wedge-shaped lugs on the drum . . . the heaviest part of the mixer. As the drum rotates, these lugs engage shaker rollers on the skip, causing the "shimmying" action. There are no cams, gears, delicate adjustments, or fast wearing parts. There is no strain or extra wear on the skip . . . no extra burden on the transmission. Skip itself is sturdily built of heavy-gauge steel for maximum service life.

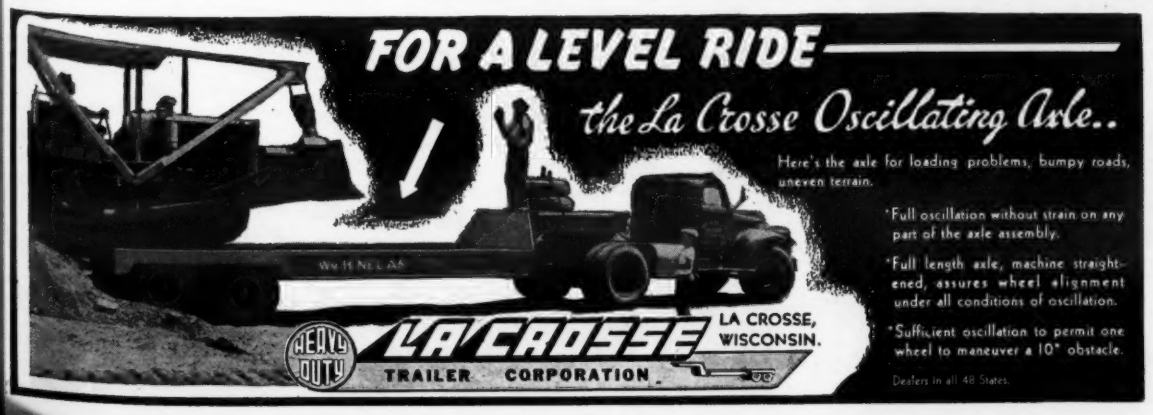
For all the facts, see your Rex Distributor or write for a copy of Bulletin No. 480. Chain Belt Company, 1666 W. Bruce St., Milwaukee 4, Wis.

CHAIN BELT COMPANY of *MILWAUKEE*

REX

CONSTRUCTION MACHINERY

PUMPS PAVERS PUMPCRETES MOTO-MIXERS MIXERS


FOR A LEVEL RIDE
the La Crosse Oscillating Axle..
Here's the axle for loading problems, bumpy roads, uneven terrain.
*Full oscillation without strain on any part of the axle assembly.
*Full length axle, machine straightened, assures wheel alignment under all conditions of oscillation.
*Sufficient oscillation to permit one wheel to maneuver a 10" obstacle.
Dealers in all 48 States.
HEAVY DUTY
LA CROSSE TRAILER CORPORATION
LA CROSSE, WISCONSIN.

Give
USO
It still means a lot to them

This Montgomery cable-cutting device is said to eliminate frayed edges and flattening of the cable. It is available in three models.

Cable-Cutting Method

A cable cutter which is said to make a quick clean cut is manufactured by Montgomery & Co., Inc., 53 Park Place, New York 7, N. Y.

The cable is first bound, at the point at which it is to be cut, with a thin sheet of pliable but tough steel. It is then placed in the cable cutter which is hit with sharp raps until the cable is cut. Both cut ends of the cable are left encased in the steel band and are substantially of the same diameter as the cable, the manufacturer points out. It is said that this method eliminates frayed edges, and that the die used prevents flattening in the cutting process.

The cable cutter is made in three sizes and will handle wire rope up to 1½ inches. The steel band, too, is made in lengths and sizes to fit various cables.

Further information may be secured from the company, or by using the enclosed Request Card. Circle No. 13.

Distributors for Maxon

Distributors for its Dumpcrete unit have been announced by the Maxon Construction Co., Inc., of Dayton, Ohio. The Dumpcrete is a special truck body for hauling air-entrained concrete.

These distributors are: Stockberger-Seastrom Co., Ft. Wayne and Indianapolis, Ind.; W. W. Williams Co., Columbus and Independence, Ohio; Boehck Equipment Co., Milwaukee, Wis.; Boehck Engineering Co., Houston, Texas; Standard Machinery Co., San Francisco; Garlinghouse Brothers, Los Angeles; McIlhany Equipment Co., Roanoke, Va.; Southern Equipment Sales Co., Columbia, S. C.; Lee Henry, Huntington, W. Va.; Hedge Mattheis Co., Boston; and D. C. Elphinstone, Inc., Baltimore, Md.

ARBA Convention

(*Continued from preceding page*)

and county engineers if this important link in the national rural-highway network is to be completed.

C. W. Phillips, President of the American Association of State Highway Officials, said: "The experimental era of road building is past. It is now a fixed science. The luxury stage is over and we are fighting in the field of necessity.

"The post-war highway program should be expedited as much as possible. Every effort should be made by the states to put their first year's program under contract by July 1, 1947. They must work hard to take advantage of every short cut to obtain that end. Plans and designs should be standardized and virtually placed on an assembly line.

"Programs should be determined, submitted, and approved as far in advance as possible, and revisions reduced to a minimum," Phillips said.

Business economics, engineering standards, design requirements, and administrative practices were discussed by all groups at the convention, including the Airport Section.

The 44th Annual Convention was confined largely to the presentation of papers and speeches, and to meetings. But delegates learned that plans have been virtually completed for the 1948 convention, which will include one of the biggest equipment Road Shows of all time. More than enough floor space to accommodate all manufacturers' displays is being reserved at the huge Tucker Plant near South Chicago.

Water-Purifying Kit

A pocket-sized water-purifying kit, which is said to make fresh water from any source safe to drink, is now being marketed commercially by Wallace & Tiernan, Belleville, N. J. Known as Aqua-Tabs, it is a peacetime adaptation of a wartime development, and employs the same principle of treatment as is used by many municipal water works.

The kit includes three types of chemicals. One is for purifying the water, one is for testing the purified water, and the third is said to remove the taste of the purifying chemical from the safe water.

Further information may be secured from the company, or by using the enclosed Request Card. Circle No. 36.

Contractors' Air Tools

The line of tools for contractors is described in a series of bulletins issued by Worthington Pump & Machinery Corp., Construction Equipment Division, Holyoke, Mass. These include paving breakers, sheeting drivers, hand held rock drills, air tools, stopers, and drifters.

Bulletin H1200-B29C describes three paving breakers and two sheeting drivers, as well as the sheeting-driver attachment. Bulletin H1200-B28E describes the three models of hand-held rock drills which the company makes. "Contractors' Air Tools" is the title of Bulletin H1200-B15E, in which are described a clay digger, a trench digger, and a backfill tamper.

The Blue Brute self-rotating stoper Model WR 31, is the subject of Bulletin H1200-B30. It features a large cutaway drawing which shows all important features and details of the tool. Bulletin H1200-B33 is a 16-page one in which the Blue Brute WPM drifters and related equipment are described.

Copies of this literature may be obtained from the company, Or use the enclosed Red Request Card. Circle No. 74.

THE BYERS SEEDER

Seeds, Rakes and Rolls in One Operation.

It will sow grass seed, commercial fertilizer, limestone or any granular material that can be broadcast on the surface of the ground and raked in.

U.S. Patent 2076702—DISTRIBUTORS WANTED

P. L. BYERS

Clyde Ohio

SURE-CURE CONCRETE CURING COMPOUND

Used on the Following Projects:

Peter-Kiewit Sons, Friant-Kern Canal

The Shea Co. & Morrison-Knudsen Co., Coachella Canal

Hubert H. Everist Sr., Delta Mendota Canal

Arizona-Nevada Constructors, Friant-Kern Canal

For full information and further details write or call

Sure-Cure Concrete Curing Compound being sprayed on Coachella Canal Job.

Clear and Pigmented Curing Compounds

S. P. LYONS

1805 COURTNEY AVE.
LOS ANGELES 46, CALIF.
Phone HEmpstead 2539

SMOOTH POWER Two-Cylinder

THE NEW ONAN AIR-COOLED "CK" ENGINE 10 H.P. 4-CYCLE

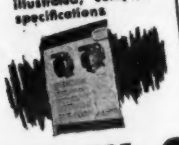
Two-cylinder horizontal opposed design gives the new, heavy-duty CK engine unusual running smoothness. Short, rigid crankshaft . . . 2-inch diameter main and 1⅝-inch diameter rod bearings . . . pressure lubrication . . . axial-flow cooling fan . . . aluminum construction giving 4-to-1 cooling advantage over cast iron . . . weighs only 97 pounds and fits neatly into 15" x 19" x 18" space. Designed to solve engine power problems in industry, agriculture and other fields. Proven by thousands in use today . . . now in mass production . . . prompt delivery.

Also has: Built-in precision governor . . . downdraft concentric carburetor for wide-angle operation . . . oil bath air cleaner . . . fuel pump . . . oil pressure gauge . . . crankcase fumes exhausted to carburetor . . . hermetically sealed magneto ignition coil with easy-to-get-at breaker points, 2-qt. oil capacity.

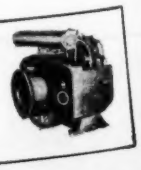
ONAN ELECTRIC PLANTS—A.C.—350 to 35,000 watts in standard voltages and frequencies, D.C.—600 to 10,000 watts, 115 and 230 volts. Battery chargers—500 to 3,500 watts, 6 to 115 volts.

ONAN AIR-COOLED ENGINES—CK: 2-cylinder opposed, 10 h.p.; BH: 2-cylinder opposed, 5.5 h.p.; 1B: 1-cylinder, 2.5 h.p.

WRITE FOR illustrated, complete specifications



Electric Starting
Built-in electric push-button or automatic starting is optional; adds little to overall dimensions.



D. W. ONAN & SONS INC.
3468 Royalston Ave. Minneapolis 5, Minn.

ONAN 4-Cycle ENGINES

The platform of this work stand, Aerostand Model 12, is hydraulically adjusted to a work level of 5 to 12 feet. The steps maintain their position parallel to the ground regardless of the working angle of the stand.

Portable Work Stand Acts As Scaffolding

An adjustable hydraulically operated work stand for use in form work, bridge painting, maintenance, and other operations requiring portable scaffolding, is now available from the Airquipment Co., Dept. DH, Burbank, Calif.

A 16-square-foot work platform, with a maximum static load capacity of 1,500 pounds, is hydraulically elevated or lowered to any working level from 3 to 24 feet, depending upon the model. A feature of the unit is its use of automatic self-adjusting steps which maintain their position parallel to the ground regardless of the working angle of the stand.

Scaffolding strips, stand extensions, and hoist attachments are available as accessories for the Aerostand. All models are equipped with guard rails and skid-proof surfaces on platforms and steps. Frames are constructed of welded tubular steel mounted on swivel casters with caster locks. Truck locks are provided to hold the stand stationary when in service.

Further information may be secured from the company, or by using the enclosed Request Card. Circle No. 4.

Steel Job Buildings

Tool houses, field offices, and other small utility buildings can now be purchased in prefabricated-metal form. The two major advantages claimed for these steel buildings are long life and low upkeep.

Made by Armco Drainage & Metal Products, Inc., 703 Curtis St., Middletown, Ohio, they are portable and adaptable to many requirements. It is said that they can be quickly wired and easily insulated; or they may be left uninsulated without affecting weathertightness. The galvanized Paintgrip surface of the Steelox buildings can be painted immediately, it is said.

Further information may be secured from the company, or by using the enclosed Request Card. Circle No. 27.

Plastic-Rock Flooring

Literature about Plastic Rock flooring is available from United Laboratories, Inc., 16801 Euclid Ave., Cleveland 12, Ohio. Plastic Rock is used for leveling, surfacing, and patching floors of concrete, wood, brick, and stone.

It is made from Siloxide rock (a manufactured aggregate), asphaltic paste, asphaltic bond, plus a setting powder. It comes in proportioned units which are mixed by adding water. The literature describes the uses, features, and limitations of this type of flooring. One complete sheet is devoted to detailed instructions on mixing and laying Plastic Rock.

United Laboratories is a nation-wide organization covering the maintenance field. It handles the products of 59 manufacturers, and certifies some of these for specific uses. The company claims that all materials it recommends are thoroughly tested in actual service before receiving a certification. It issues a handy reference chart for maintenance superintendents and engineers, which indicates the principal ULI products and processes.

Copies of this literature may be obtained from the company. Or use the enclosed Red Request Card. Circle No. 86.

Rubber Hose for Pumping

A new 4-page illustrated folder covering Monarch water suction hose now is being distributed by the Hewitt Rubber Division of Hewitt-Robins, Inc., 240 Kensington Ave., Buffalo 5, N. Y.

Monarch is designed for heavy-duty pumping operations in the construction field and is claimed to withstand severe conditions of exposure to corrosion and abrasion.

Copies of this literature may be obtained from the company. Or use the enclosed Red Request Card. Circle No. 85.

HOT or COLD *Mix Asphalt*

SIMPLICITY
ASPHALT PLANTS

DEPENDABLE

THE SIMPLICITY SYSTEM COMPANY
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CRAWLER AND WHEEL TRACTORS • DIESEL ENGINES • POWER UNITS

Left, a Thew 1½-yard dragline loads the flatcar work train which Hamer Brothers revamped for its right-of-way grading contract with the Grand Trunk Western Railroad Co. When the work train reaches a prescribed stretch for grading, a Caterpillar D6 tractor (at right), riding the flatcar deck, bulldozes the dirt over the apron.

RR Grade Built Up By a Novel Method

An unusual method was used recently by Hamer Brothers, Inc., of Detroit, on a right-of-way grading job for the Grand Trunk Western Railroad Co.

The contractor revamped large flatcars 10½ feet wide and 58 feet long; he erected wooden sideboards 4½ feet high along one side of the cars, and hinged wooden aprons to the opposite side of the cars. Between cars he extended steel runways to form a deck.

A dragline is used to load this flatcar deck with dirt—about 330 cubic yards to eight cars. After the 8-car work train reaches the prescribed stretch for grading, a Caterpillar D6 tractor with bulldozer, riding the flatcar deck, bulldozes the dirt over the apron which extends well over the end of the ties and clears the rail by 52 inches.

The operation deposits an average load in 20 minutes, Hamer Brothers reports, and has spread as much as 1,000 yards in a single day. This yardage has been achieved in spite of delays caused by clearance for trains on a single-track main line, and the time consumed in reloading the flatcars after disposal of their load.

Power-Shovel Unit Mounts On Standard Truck Frames

Literature is available on a shovel unit for mounting on any standard truck chassis. It is made by the Quick-Way Truck Shovel Co., 4150 Josephine St., Denver 1, Colo. Model E is built to mount on any standard 5-ton truck, and Model J on any standard 1½-ton truck. These units are said to be readily convertible into trench hoe, crane, dragline, clamshell, orange peel, or pile driver.

As a crane, Model E is rated at 6 tons and Model J at 3 tons. Shovel, dragline, and trench-hoe buckets for Model E have a 4/10-cubic-yard capacity; for Model J, ¼-cubic-yard. Swinging speed for Model E is 7½ rpm; for Model J, 9 rpm. Road clearance for Model E when mounted is up to 12 feet, depending upon the truck used; for Model J it is 9 feet 2 inches.

The literature lists all features claimed for the unit, as well as specifications for the various attachments.

Copies of this literature may be obtained from the company. Or use the enclosed Red Request Card. Circle No. 61.

Represents CSPA in Ohio

The appointment of a district representative for the Ohio area has been announced by the Clay Sewer Pipe Association, Inc. The new representative, Edward W. Hartman, will make his headquarters at 1105 Huntington Bank Bldg., Columbus 15, Ohio, main office of the organization.

Once-a-Season Lubrication Feature Helps Keep Equipment on the Job Day in and Day Out

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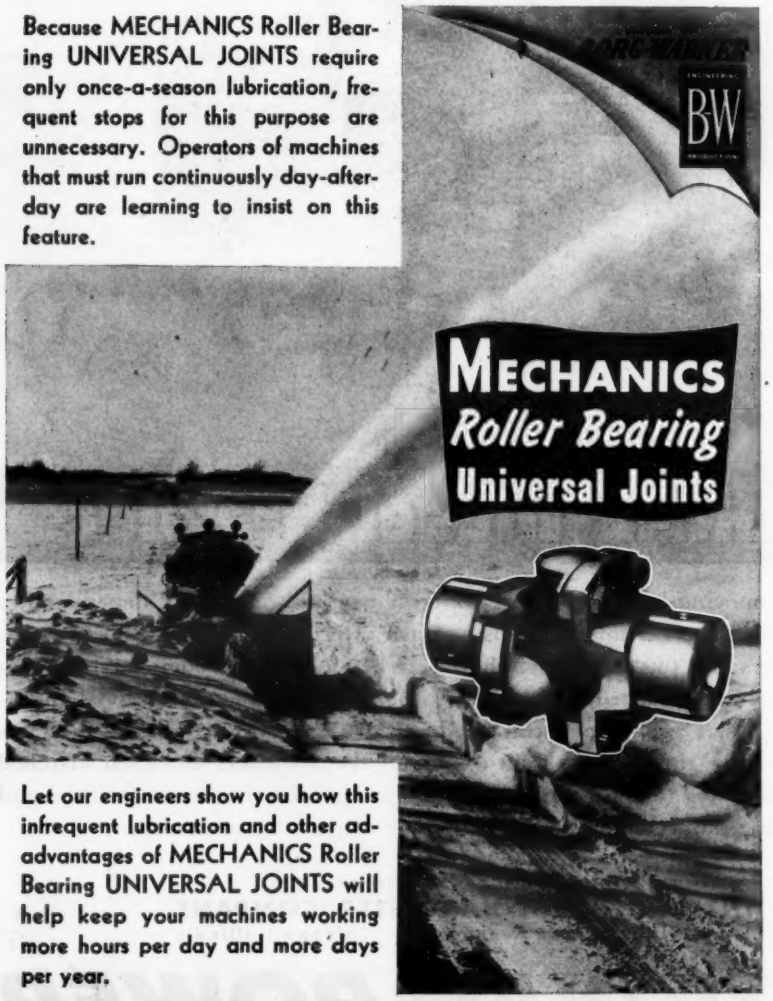

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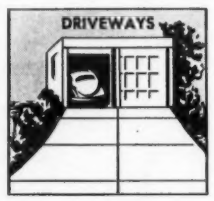
Keystone Fibre and Premoulded Asphalt Expansion Joints are widely accepted in modern concrete construction as a safeguard against costly cracks and blow ups that come from improper spacing and cushioning of expanding slabs.



In all types of concrete construction such as highways, airport runways, side walks, drive ways or large industrial floor areas, Keystone Expansion Joints have met all standard specifications to justify maximum smoothness, strength and stamina required. When Kapco 336 is used as a sealer these joints are completely waterproof.

Kapco 336 Rubber Asphalt SEALING COMPOUND FOR ALL JOINTS

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Engineers Attend Highway Meeting

The Eighth Engineering Conference Sponsored by University of Utah Has Important Speakers

✦ EARTH-MOVING equipment of the future cannot economically become much heavier. This view was expressed by Kenneth F. Park, Manager of the Sales Development Division of Caterpillar Tractor Co., at the 8th Annual Highway Engineering Conference held at Salt Lake City, March 3-5.

"Any changes," he said, "will be in new types of transmissions, better torque converters, and better metals. The relationship between tire penetration and drawbar loss, when all the facts become known, may also improve present outputs."

Mr. Park's discussion of the past, present, and future of earth-moving methods was one of the papers featured on the conference program, which this year drew 200 delegates including engineers from states far outside the central Rocky Mountain region. The highway conference was started in 1940, as a regional meeting for the welfare of the engineering profession near Salt Lake City, by Prof. A. Diefendorf, Head of the Department of Civil Engineering, University of Utah. Since then its attendance has grown until available university facilities were taxed to the limit this year to accommodate engineers, contractors, and manufacturers represented there.

Going back to 4500 B.C., Mr. Park said, "There is little doubt in my mind that as great a quantity of dirt was moved by hand labor through the years of antiquity as was ever moved mechanically, because the moving of earth by mechanical means is a new science." He pointed out the metamorphosis of mechanical earth-moving equipment, reminding many members of the audience that the changes have occurred in their lifetimes.

No Change in Digging Ratio

However, discussing the evolution of equipment, Mr. Park said that the ratio of a pound of earth per pound of expended power per minute of digging time has been constant over the last thirty years. And it seems unlikely to him that this ratio will change. "The introduction of rubber tires changed loading-performance characteristics on wheeled scrapers by one or two gears," he pointed out, "but we have now discovered a power loss at the drawbar if rubber tires bite too deep in the earth."

Because of the improved rubber-mounted hauling equipment in the earth-moving business, the manufacture of large-size tires has become a big business, he said; output has jumped from 3 to well over 500 tires per day. With the steering defects of two-wheeled units now well on the way towards elimination, Mr. Park said that these units with cable controls will be extremely popular in the future, particularly in the 15-cubic-yard sizes and under.

As for future trends in equipment other than tractors, he predicted that compacting and processing machines will be improved, but that rippers and rooters will not change. Motor graders will have larger tires and more horsepower. The conveyor method of moving earth may be used to a greater extent, he said, and a 50-cubic-yard power shovel will soon be built. All equipment is being designed with an eye to operator comfort, in an effort to eliminate fatigue.

Public-Lands Facts Aired

Speaking of public lands in the west, State Highway Engineer Robert Allen of Nevada urged that substantial public lands throughout the west be retained in public, or Federal, ownership.

"Uncle Sam, with his vast landholdings in most of the western states, is at once the greatest taxpayer because he is the state's most important customer," Mr. Allen pointed out. "Should public lands be returned to the states, and offered for private ownership, incredibly large sums of additional money would have to be raised to offset the reduced ratio between state and Federal landholdings."

Mr. Allen, who is Vice President for the western district of the American Road Builders' Association, showed that Nevada would have to collect 13.6 cents per gallon in state gasoline taxes to do the same highway work if all public lands in Nevada were turned back.

In like manner, he showed factually that a vast percentage of the lands could not be sold to private owners because of undesirable land characteristics. Thousands of acres of railroad lands remain unsold in Nevada, and much public land cannot economically be purchased and used for grazing purposes, he said. If current bills in Congress are enacted into law, turning over all or part of these lands to states, citizens of the entire country will suffer a setback in western roads.

"Nevada, along with many other western states, is a 'bridge state', carrying traffic from the east towards California and back," Mr. Allen explained. "Under the present financing scheme, the Federal government is contributing a share of the funds for road building in public-lands areas, which is proper and fair. Citizens of other states, who are also citizens of the Federal government, can thus enjoy Federally built roads in Nevada.

"But if this situation changes, and the State has to pay the bill for highways through those lands, it will mean that Nevada's few people will have to foot the bill to accommodate in large measure the great amount of transient traffic."

Action in the form of a resolution by the Western Association of State Highway Officials in Los Angeles during December, 1946, is an indication of the seriousness of the public-lands situation. Ray Leavitt, Chairman of the Utah State Road Commission, and Roy W. McLeese, its Chief Engineer, lined up solidly with Mr. Allen on the subject.

Public Relations Needed

V. J. Brown, Director of Publication of *Caminos y Calles*, Chicago, Ill., urged highway engineers to tell the public the facts, and to present the facts in such a way that laymen can understand and appreciate the need for road-building funds.

"You can prove your case only by showing that highway construction funds are dropping, while highway

(*Concluded on next page*)

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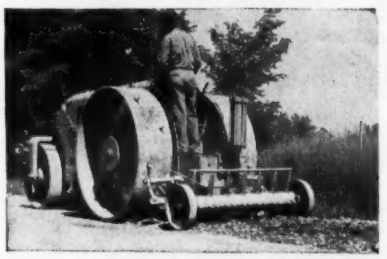

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Highway Meeting

(*Continued from preceding page*)

travel is increasing," he said. Citing the example of the Benefit-Cost Ratio of the New Jersey State Highway Department in justifying its new construction, Mr. Brown said it was high time that something similar be adopted by other states to educate the bill-paying public. He also pointed out that futuristic movies or plays, using high-talent actors and directors, might well be used to acquaint the public with the need for better highways.

Other Important Subjects

The use of stream-flow records in connection with drainage problems was urged by Tate Dalrymple of the U. S. Geological Survey of Urbana, Ill., as he told how more and more stream-gaging and run-off studies were being planned.

Pumpcrete practice was explained by R. T. Sherrod of the Chain Belt Co., Milwaukee, Wis., and a paper by G. T. Bath of Cheyenne on Wyoming's secondary-road system was read. J. W. Cravens, Senior Resident Engineer of the Texas Highway Department, explained design criteria and construction methods on soil-cement roads in east Texas.

Asphalt as a soil-stabilization agent came in for discussion by John R. Banning, Division Engineer of the Asphalt Institute at Denver. He told how soils research had opened up a tried and proved field for soil-asphalt. He told of many types of soils which have successfully been stabilized, and urged careful laboratory analyses and control always, wherever asphalt is used for this kind of work. How geology has played an important part in highway design and construction, particularly in the Kansas State Highway Commission, was told by Ernest Dobrovolny, geologist with the Denver office of the U. S. Geological Survey.

Studies made by D. F. Larsen, Materials Engineer for the Utah State Road Commission, regarding the effect of alkali soils on concrete were revealed. Mr. Larsen said that the harsh soils in certain sections of Utah had eaten concrete away as far down as the reinforcing steel on many 10-year-old structures. The use of more cement in such regions was discussed as a solution of the problem.

Safety, the essential element in highway engineering, was stressed in a talk by Deputy Commissioner H. E. Hilts of the Public Roads Administration, Washington, D. C. Safety was also discussed in various forms by F. Clark Sanford of the Salt Lake City Police Department, Edwin S. Moore of the California State Automobile Association, Traffic Safety Engineer Harry Wright of the Utah State Road Commission, and Ellis L. Mathes, Traffic Engineer, Idaho Bureau of Highways.

Kentucky Tests Rock Salt As Ice-Control Measure

The results of its first general use of rock salt for ice control have been announced by the Kentucky Department of Highways. The Department's maintenance engineers were pleased with the salt's action, and said that all main highways were rapidly cleared. Drifts and snowfalls would have made this difficult, they said, if normal maintenance operations had been followed.

Over 6,000,000 pounds of rock salt was used. With the salt established, they found that it worked from the center out, under traffic. It was spread at the rate of 400 pounds per mile per hour. And in addition to its melting action, they said, it also served as an abrasive. Costs ran about $3.00 per mile.

The Kentucky engineers recommend that the salt be applied with the first inch of snow. They found that for best results the temperature should be between 20 and 30 degrees; that low temperatures tended to retard quick clearance in some instances; but that action started immediately when the temperature rose.

To offer owners year-round utility Minneapolis-Moline has designed the model RTI and UTI tractors to accommodate a wide variety of attachments . . . Dozers, snow plows, material buckets, lifting forks, winches, and many other tools make MM industrial tractors the hardest workers on any construction job . . . New extra heavy duty front wheel and axle construction now provides increased strength for lifting larger pay loads.

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Pre-Mixed Patches Used With Success

(*Continued from page 1*)

matter of fact, some of the material they mixed and stockpiled is still being used today, four years later. They recommend, however, that it be used within two years.

Composition of Pre-Mixed Patch

Composition of the pre-mixed material is held precisely to this formula:

Mineral aggregate	77	per cent by weight
Rock-asphalt dust	19.25	per cent
RO-3 road oil	3.75	per cent

Mineral-aggregate contracts are advertised for bid, and prospective suppliers of this material have to meet Texas Highway Department specifications known as the 303 A2 Modified Analysis, as follows:

Size Opening	Per Cent Retained
⅜	0
No. 10	50-90
No. 20	85-100

Screen analyses for rock asphalt have to meet these requirements:

Size Opening	Per Cent Retained
No. 4	0
No. 40	50-70
No. 200	80-97

Aggregates as a rule come in by railroad in carload shipments from points up to about 150 miles away. Rock asphalt is produced at Uvalde, Texas, and generally comes from that vicinity. Road oils are produced throughout the state of Texas wherever oil fields are found.

The fine size of rock aggregates produces the fine long-wearing feather edges on the patches. When Arbuckle tried larger aggregates, he found that they were not as workable and would not make the smooth-riding transition he wanted.

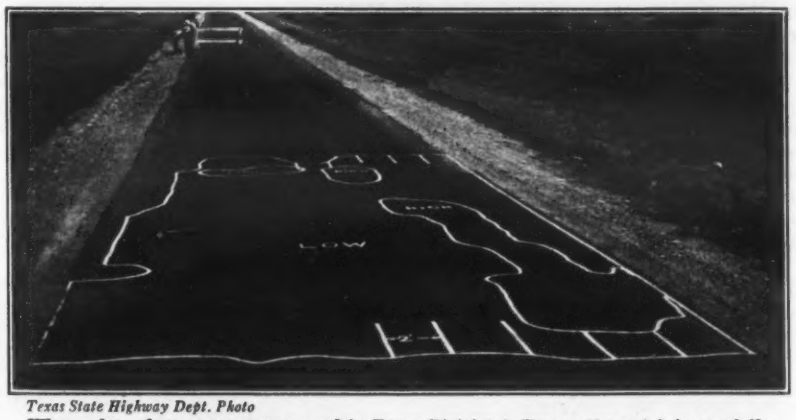
Pre-Mixing Methods

For the pre-mixing of a stockpile of this material, District 6 built up a portable mixer on an old Liberty flat-rack truck. A Blystone ½-cubic-yard mixer was installed on skids near the truck cab, and kerosene burners put under the mixing drum to keep the mix temperature around 200 degrees. A kerosene pressure tank for burner fuel was mounted near the mixer.

Driving power for the mixer is furnished by a Continental gasoline engine, mounted well back on the stern of the truck bed in line with the mixer drive axis. An asphalt pump was set in place, and return lines were installed so the road oil could be continuously circulated. The portable mixing rig was designed to work with a heater, hooked by hose to the pump connections.

It has been found best to unload the aggregate from railroad cars and stockpile it somewhere close to the mixing site, in order to give it a chance to dry out as much as possible. When premixing begins, workmen who feed this aggregate to the mixer work all the way around the stockpile to keep getting dry aggregate.

Standard beam scales, such as contractors use on small concrete pours, are used for the weighing of aggregates and rock asphalt. The aggregate for a batch is first weighed and dumped by wheelbarrow into the skip. It goes from there into the "beater" chamber of the mixer, and about 60 per cent of the road-oil content is dumped in from a graduated measuring tank just above the hopper. This oil is fed in at a temperature of 200 degrees F.



Texas State Highway Dept. Photo

When a low place appears on a road in Pecos District 6, Texas, the patch is carefully outlined by string line, marked with carpenter's chalk, and the marks joined with chalk or asphalt emulsion to leave a clear outline.

The material is mixed for approximately 40 seconds in dry, sunny weather—mixed until all aggregate particles are coated thoroughly. Then a little more oil is put in, and the rock asphalt is added. Next, the remainder of the oil is added and the material mixed for an additional 30 seconds. In good weather the outfit will turn out a batch every 2 minutes. Batches have been standardized at 1,300 pounds.

Fine rock asphalt has a peculiar affinity for liquid road oil, and the mixer men caution workers never to put the rock-asphalt dust in until after the larger aggregate particles are well coated. Rock-asphalt dust mixed with RO-3 can become a mess of pure goo in nothing flat, but when the aggregates have been pre-mixed it blends in nicely.

A ten-man crew for pre-mixing has proved to be the fastest and most efficient. Recently the rig was moved 30 miles and five carloads of aggregate were mixed in a day's run, according to District Maintenance Engineer R. H. Spiller, with this crew:

(*Continued on next page*)

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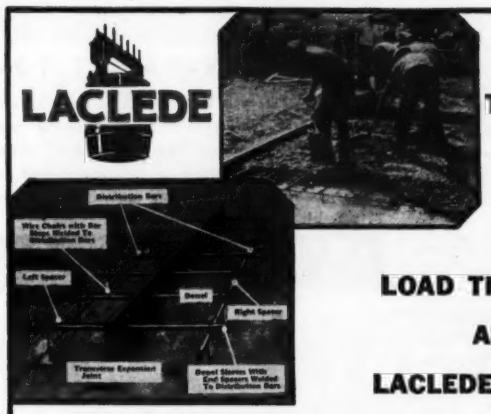
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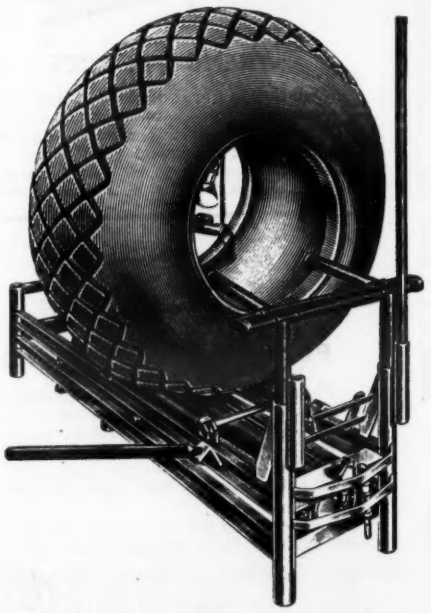

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Texas State Highway Dept. Photo

Texas pre-mixed patches are raked as little as possible so the thorough job done by the mixing crew is not disturbed. Here a steel float is being used; it does a better job than the back of the rake, which is also shown in use.

Pre-Mixed Patches Used With Success

(*Continued from preceding page*)

1 man running mixer
1 man heating road oil
4 men handling aggregate to mixer
2 men handling rock asphalt to mixer
1 man at scales
1 man and truck hauling mixed material from mixer to stockpile

The material can be made up for a cost of from $4 to $6 per ton, and a ton will cover 20 square yards 1 inch thick. The material works much better in the field if it is stockpiled from 60 days to 6 months after mixing. It shows a tendency to crust if kept longer than 2 years, but a few stockpiles are being finished up this spring which were mixed four years ago.

Field Patch Application

If the control of mixing is precise, the placing of the material on roads is even more so. The District has several exceptionally keen-eyed maintenance foremen, but even they check their work very carefully with a carpenter's string line.

When a low place appears on a road, the location of the patch is carefully outlined by stretching a tight string line longitudinally with the center line about every 2 feet. Ends of the string are kept well back on grade. Where the string leaves the pavement, a man marks the pavement with carpenter's chalk. The marks are joined with chalk or asphalt emulsion, and a perfect outline of the patch is thus made before the work begins.

A tack coat of 50-50 emulsified asphalt is swept on with a worn house broom, covering all the area of the patch. Western Texas has some extremely cold winter weather, but the Department uses emulsified asphalt for almost all tack work because it will not bleed up through the patch. Neither will it smear on an adjoining surface under the action of traffic.

The cut-backs invariably bleed when they are used for tack-coat work, and are used only in very cold weather. Good patch men who are putting down these smooth-riding nice-looking jobs stick to emulsion.

If a patch is to be more than 2 inches deep, it is applied in layers about 1½ to 2 inches in thickness, and each layer rolled before the succeeding one is applied. The material is not applied until the emulsion tack coat breaks. Then the field workmen carefully apply the material with shovels.

Simply throwing the pre-mixed patching out of a truck results invariably in a segregation and non-uniform compaction. The mix is handled very carefully, so the thorough job done by the mixing crew is not disturbed. Patches are raked as little as possible and then with the back of a garden rake. Field checking for grade is done with a long straight-edge, held at about a 45-degree angle from the longitudinal center line of the road to prevent any corrugation in the patch.

Tolerances of ⅛ inch in 10 feet are allowed, and that does not mean ⅜ or ½ inch. Veteran maintenance men have developed a great deal of pride

(*Concluded on next page*)

With CON-VAY-IT 12-20 CONCRETE SPECIAL contractors in all parts of the country are pouring concrete in about 1/5th the time formerly needed. They're also using this versatile conveyor for loading and unloading trucks, removing excavating materials, and conveying bricks, blocks, dry aggregate, etc.

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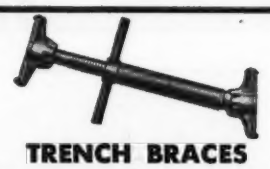

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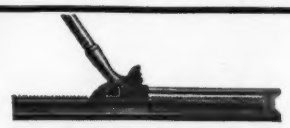

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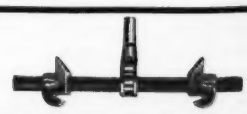
Plumbing contractors, public utility companies, city water and sanitation departments find this double acting ratchet jack unique for laying or removing pipe in places of uneasy access. Capacity—15 tons. Length, 8 feet. Travel of cage, 7 feet.



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These are just a few of the many types of Duff-Norton Jacks available for every construction requirement. Write today for Catalog 203 which illustrates and describes our complete line.

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BUY *all the Bonds you can . . .* **KEEP** *all the Bonds you buy*

Pre-Mixed Patches Used With Success

(Continued from preceding page)

in their work by this time, and the very men who once protested vigorously about weighing the mix now boast about it.

The lifts are brought up level with the adjoining roadway surface, but not left full. They are rolled down with a small two-wheel smooth roller, and the patches turned over to traffic for about four days.

After four days the edges of each patch are painted with a 6-inch stripe of emulsified asphalt; about 3 inches is put on the patch and about 3 inches on the original road surface. This treatment has prevented any raveling at the feather edges of patches. Some experiments are now under way to eliminate this final emulsion stripe, on the theory that it makes a patch conspicuous. But if any raveling appears these patches will be outlined as the others have been.

Finished patches are very carefully checked by string line after they have been placed, and if any adjustment is necessary it is made then and there.

Veteran maintenance men claim that the difference in production speed between this careful way of applying a patch, and the obsolete and haphazard method still used in many places is not enough to be noticeable. They stress the fact that careful control of the premix, and careful application of the material in the field will do a surprisingly smooth job, and do it rapidly.

With years of experience behind them, these Texas boys west of the Pecos place highway patches that you simply cannot feel at 60 to 70 miles an hour. And the patches stay put for the life of the highway. That fact alone justifies the care and time that go into maintenance work.

The State of Texas now maintains some 26,000 miles of highway, of which 18,800 miles are asphalt-surfaced. It spends approximately $350 per mile per year for maintenance of its vast highway system. This work is one part of a gigantic research and improvement program which never halts.

Personnel

R. E. Killmer is now the District Engineer at Beaumont, and Elston Arbuckle is in District 18. Kelly and Spiller are carrying on at Pecos District headquarters, under the supervision of State Highway Engineer D. C. Greer. G. B. Finley is the State Maintenance Engineer of the Texas Highway Department.

C. & E. M. Photo

Raymond P. Day, Western Editor of CONTRACTORS AND ENGINEERS MONTHLY, points to the outline of a smooth-riding patch on U. S. 285 north of Pecos, Texas. The 6-inch stripe of emulsified asphalt prevents raveling at the patch edges.

Chlorinated-Rubber Base For Concrete, Steel Paint

A technical book on Parlon, a chlorinated-rubber product used as a base for paints, is now being distributed by the Hercules Powder Co., Inc., 915 King St., Wilmington, Del. The base is designed especially for paints used on concrete and other surfaces exposed to action of chemicals, gases, moisture, mold growths, and other destructive agents.

The book is divided into two parts, one on the properties and the other on the uses of Parlon. It is also made in two types for use in traffic paints. Formula No. 1 has shown good results, it is claimed, in tests on roads subjected to heavy traffic. Formula No. 2 was designed for holding glass beads to give increased reflection from traffic stripes.

Copies of this literature may be obtained from the company. Or use the enclosed Red Request Card. Circle No. 84.

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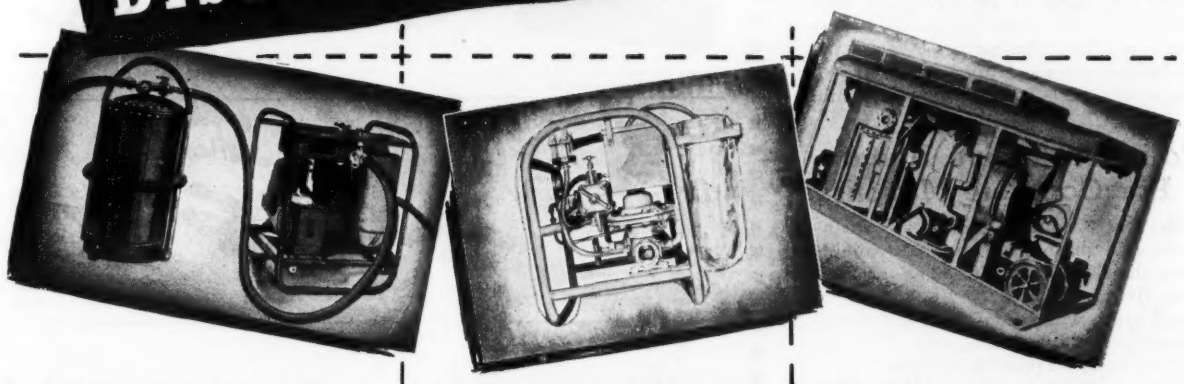

Portable Water Purification Unit (Mobile) Converts impure water into clear, clean drinking water. The equipment can be cleaned easily with little loss of operating time. Consists mainly of a pumping unit and a filter unit. The water is cleaned by harmless chemicals. Forcing water reversely through the filter, washes the unit thoroughly. Available in "unused" and "used" condition at WAA Regional Offices indicated below.

Location: Atlanta, Birmingham, Charlotte, Dallas, Houston, Jacksonville, Kansas City, Little Rock, Los Angeles, Nashville, New Orleans, New York, Richmond, St. Louis, Salt Lake City, San Antonio, San Francisco, Seattle and Spokane.

Hypo-Chlorination Unit (Automatic)—This equipment efficiently chlorinates from 2 to 100 gallons of water per minute. The chlorine feed can be proportioned over a range of 10 to 1 for any one setting of the adjusting valve. Unit consists of hydraulic operated hypochlorinator, water meter, pressure regulating valve and manual range adjusting valve. Installation is simple—just connect the unit into the water line.

Location: Charlotte, Houston, Nashville, New Orleans, New York, Richmond, Salt Lake City, San Francisco and Spokane.

Water Distillation Unit—This equipment is adaptable to many uses by industry and small field organizations. Some units are trailer mounted fully equipped with tires, ready to move to the working locale; other units are portable, neat, compact and mounted on skid-type frames. Unit consists of a gasoline engine, steam compressor, and other parts and necessary piping all assembled and mounted on a structural steel base. Most of the units need no direct fired fuel burning equipment. A few units have oil burners.

Location: Trailer mounted type: Atlanta, Boston, Los Angeles, Nashville, New Orleans, New York, Richmond, Salt Lake City and San Francisco. Location: Skid-mounted type: Birmingham, Boston, New York, Richmond, Salt Lake City, San Antonio, San Francisco and St. Louis.

All purchases are subject to the War Assets Administration's standard conditions of sale, and all items are subject to prior sale.

Priority claimants have already had an opportunity to fulfill their requirements. Arrangement for inspection of these units may be made at any Regional Office where inventory is located.

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1043

Flood-Control Funds Allow Some New Work

Through new action, the Corps of Engineers, U. S. Army, will be able to carry out in part its original program of flood-control construction. The ceiling placed on the original appropriation has been revised to permit a total expenditure of $185,000,000 during the fiscal year of 1947.

This revised ceiling will permit construction to continue on projects which were under way when the original directive was received. It will also permit some additional construction work on projects already under way, where such action is required for an orderly sequence of construction operations.

The flood-control projects include dams, flood walls, levees, check dams, diversion channels, channel improvement and rectification, and related works. It may be possible to start a few of the most urgently needed new flood-control projects, if the required approval of their initiation can be obtained from the Office of Temporary Controls. The revised ceiling will also allow advance planning to be continued on a limited number of projects, and additional progress on important stream surveys now being made.

For river and harbor projects, the expenditure ceiling for the fiscal year 1947 has been set at $105,000,000. Of this, $25,000,000 is for new work; the remaining sum is for maintenance, repair, and operation of waterway and harbor projects, and related activities. The available funds will permit some advance planning on authorized projects and some progress on authorized investigation.

The ceiling of $25,000,000 for new construction will permit work on the few projects that were already under way or contracted at the time the directive limiting Federal public-works expenditures was issued. Various river and harbor projects throughout the United States—for which funds have been appropriated by Congress, and which are needed to facilitate navigation—will be initiated as soon as the limitations imposed upon the Corps of Engineers civil-works program permit.

Paint Protective Agents For Concrete Masonry

Several products of interest to concrete and masonry men are available from the E. L. Rahm Co., 720 So. Michigan Blvd., Chicago 5, Ill. Three of these are a waterproofing agent, a masonry protective paint, and a cream said to make oil paint go farther.

Turesco Plasticizer is a waterproofing agent in cream form. When combined with water and aggregate, it is said to break down the surface tension of water, and create a closer bond between sand, stone, and cement. As the concrete cures, the catalytic action of the Plasticizer is said to bring about a dense material which will not admit water.

Turesco masonry paints have been in use for over ten years, and it is claimed by company officials that in addition to covering and coloring, they also protect and preserve. They are said to be resistant to hot or cold water, steam, acids, oils, gasoline, kerosene, lubricants, frost, ice, sun, and smoke.

The reason behind this protective ability, the company explains, is a secret catalyst which chemically converts the paint during a 5-day curing period, into a porcelain-like finish. Furthermore, the paint is said to work from the inside out and from the outside in, and to become an integral part of the masonry. Turesco paint is available in ivory, buff, green, peach, gray, or white.

As for Ex-Ten, the company says that when it is added to equal parts of oil paint and water, it doubles the quantity and improves the quality of the original mixture. It is almost odorless; it is color-true to the original; it does not powder or dry out; it can be used on any kind of surface; and it also serves as a rust-preventive when used over metal surfaces, the manufacturer points out.

Further information may be secured from the company, or by using the enclosed Request Card. Circle No. 25.

New 1947 Associated Equipment Distributors officers and directors at the 28th Annual Convention, Edgewater Beach Hotel, Chicago, Ill., February 15. They are: front row, left to right, H. L. Burleson, Browning-Ferris Machinery Co., Dallas, Texas, Vice President and Director of Region 10; William A. Danner, Parker, Danner Co., Hyde Park, Mass., President and Director of Region 1; A. F. Garlinghouse, Garlinghouse Brothers, Los Angeles, Calif., Executive Vice President and Director of Region 11; and C. F. Halladay, Halladay-Dettman Co., Sioux Falls, S. Dak., Vice President and Director of Region 8. Second row, left to right, Maxwell J. Lyons, Lyons Machinery Co., Little Rock, Ark., Director of Region 13; Eldon M. Parnum, Allied Construction Equipment Co., St. Louis, Mo., Treasurer; C. F. Winchester, Executive Secretary, Washington, D. C.; Harry J. Hush, Griffin Equipment Corp., New York, N. Y., Director of Region 2; and Fred M. Viles, Fred M. Viles & Co., Spokane, Wash., Director of Region 12. Third row, left to right, James W. Bell, James W. Bell Co., Cedar Rapids, Iowa, Director of Region 9; J. Walker Wilson, J. Walker Wilson Machinery Co., Youngstown, Ohio, Director of Region 6; Edward J. Crosby, Hedge & Mattheis Co., Boston, Mass., Director of Region 1; George W. Swart, Contractors Machinery Co., Grand Rapids, Mich., Director of Region 7; and R. L. Arnold, Arnold Machinery Co., Inc., Salt Lake City, Utah, Director of Region 14. Vincent J. Sheridan, Sheridan Equipment Co., Ltd., Toronto, Ontario, Vice President and Director of Region 15; George N. Crawford, G. N. Crawford Equipment Co., Pittsburgh, Pa., Director of Region 3; A. E. Finley, North Carolina Equipment Co., Raleigh, N. C., Director of Region 4; and L. J. Moore, Tri-State, Inc., Atlanta, Ga., Director of Region 5, were not present.

Half-Track Truck Models

Half-track trucks designed primarily for off-the-road operations in difficult terrain are described in literature available from The Linn Mfg. Corp., 250 W. 57th St., New York 19, N. Y. In appearance, the Linn Haftrak resembles the conventional truck, except that the propulsion is through tracks which are used in the place of rear wheels.

A table in the folder gives a complete list of specifications for all models, whose capacities range from 5 to 50 tons. It has pictures of the Haftraks with rear or side-dump bodies, bulldozers, snow plows, power shovels, cranes, etc., attached to or mounted on the chassis.

Also illustrated is the Catruk model, which has four wheels as a truck and tracks in the rear. The rear wheels are hydraulically retractable, so that the unit may be operated as a truck or half-track to meet the ground conditions.

Copies of this literature may be obtained from the company. Or use the enclosed Red Request Card. Circle No. 83.

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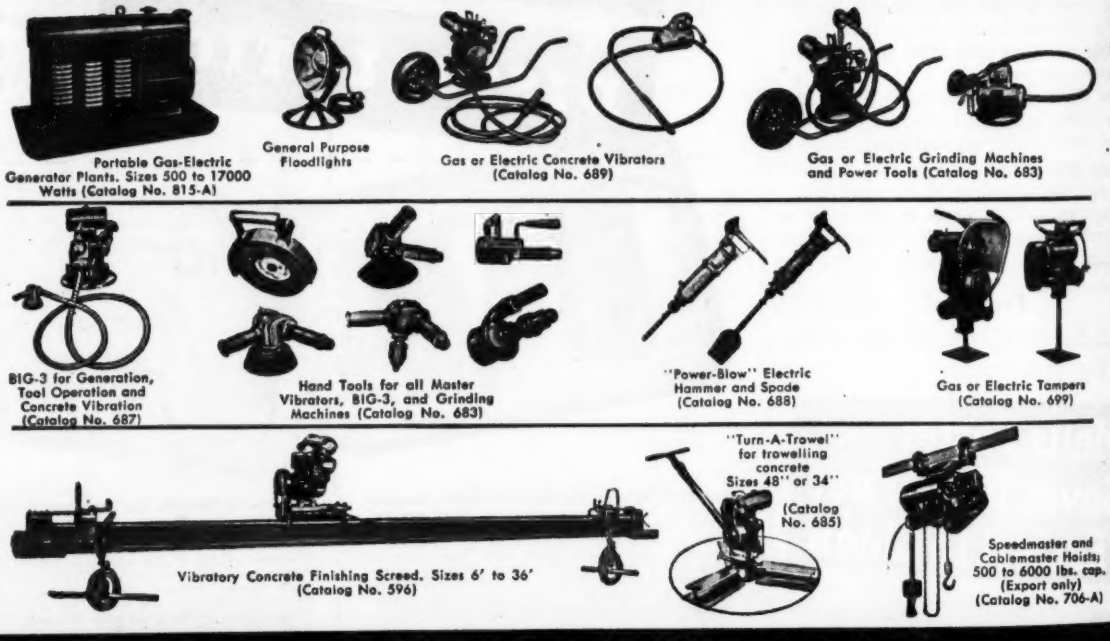
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Road Test Sections Are Now Evaluated

Treatments of Subgrade Under Concrete Paving Show That Granular Base Course Is Most Effective

By E. A. HENDERSON, Graduate Assistant, Joint Highway Research Project, Purdue University, and W. T. SPENCER, Soils Engineer, State Highway Commission of Indiana

ONE of the many problems which face designers of concrete pavements today is selection of the proper base or subgrade to help the pavement withstand the volume and weight of modern traffic. With this in mind, the State Highway Commission of Indiana, during the construction of U. S. 30 in 1937, installed seven test sections with differently treated subgrades.

Many structural failures have developed on this highway. A study of them offers a way to evaluate the effect of the various subgrade treatments on pavement performance by comparison with the untreated portions. Aerial strip maps were used as one means in the evaluation.

The performance data obtained indicate that six of the subgrade treatments improved the concrete-pavement performance. Granular base courses contributed the most; the result of their use was a pavement of nearly as good riding quality today as at the time of construction nine years ago. Mixing bituminous materials with the fine-grained subgrade soil also improved the pavement performance, but not as effectively as did the granular base courses. No significant differences in pavement performance were readily apparent among the three bituminous-treated sections themselves. But all three treatments improved the performance in comparison with untreated sections.

The study of the effect of these various subgrade treatments on the performance of this heavily traveled concrete pavement, which is constructed on plastic silty-clay soils, was conducted as a cooperative investigation by the State Highway Commission of Indiana and the Joint Highway Research Project of Purdue University. It was reported on in a paper presented at the 1946 Annual Meeting of the Highway Research Board.

Types of Treatments

The experimental treatments included constructing base courses with granular materials (sand, stabilized material); treating the subgrade with limestone dust; treating the subgrade with bituminous materials (tar, emulsified asphalt, liquid asphalt); and saturating the subgrade with water. This portion of U. S. 30 is subject to all the elements which conduce to pavement failure because of pumping action: namely, heavy traffic, fine-grained subgrade soils, and wet subgrade conditions. In 1940 pumping action began; it has resulted in a large number of structural failures in the pavement.

Since construction, differences in pavement performance between the experimental sections and the untreated portion of U. S. 30 have become more and more noticeable. In the summer of 1946, the authors made a detailed survey of the road in order to evaluate the effect of these treatments on the pavement performance. Faulting at joints was selected as the criterion on which the evaluation would be based.

As many factors contributing to this faulting were considered as it was feasible to evaluate. The most important are subgrade soils, traffic, types of load-transfer devices used, and profile (cut, fill, gradient). The survey included the test sections and the opposite untreated lane; it also included adjoining untreated portions of both lanes so that the test sections might be compared to untreated sections subjected to the same influences.

Design Features of U. S. 30

For this evaluation, a detailed study was made of approximately 9 miles of the highway. This strip is in Lake County, in the northwest corner of Indiana. The section considered lies between the intersections of U. S. 30 with U. S. 41 and the C & O railroad.

The roadway is of modern design. In cross section the 200-foot right-of-way contains two 22-foot slabs separated by a 44-foot dividing strip with a center ditch, and a 56-foot strip on either side of the pavement. The 9-7-9-inch slabs are reinforced with steel mesh and were designed with expansion joints normally spaced at 40-foot intervals. No contraction joints were used.

The grading of the highway was completed during the 1936 construction season. In 1937, contracts were let for paving. One of these contracts included the seven subgrade treatments in the eastbound lane of the dual-lane pavement.

(*Continued on next page*)

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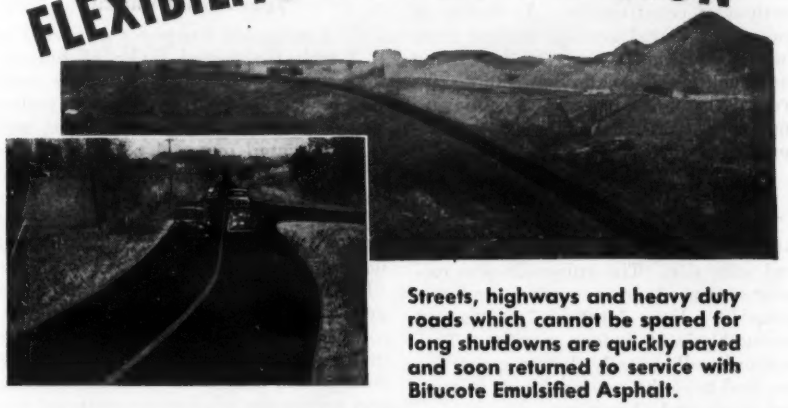

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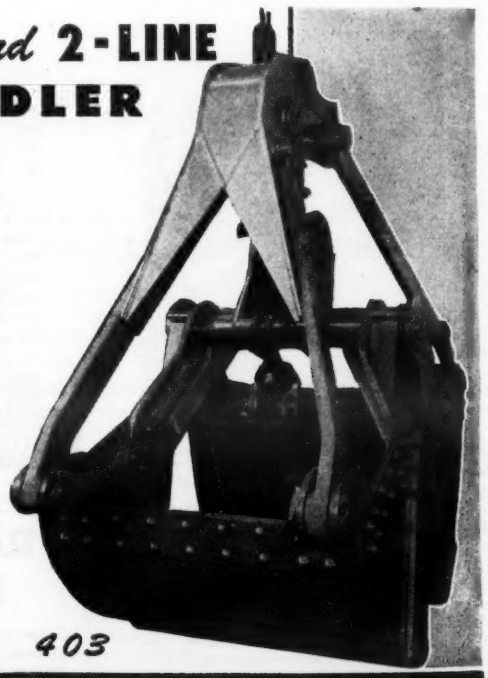

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Road Test Sections Are Now Evaluated

(*Continued from preceding page*)

Construction of Test Sections

The test sections, all constructed in the eastbound lane, are not continuous; they are separated by intersections with railroads and major highways.

The treatments applied to the test sections varied greatly in type and method of construction. As the work was experimental, several changes from the specifications were made during construction. The following summaries are only brief descriptions of the nature and method of construction of the experimental sections.

Sand-Base-Course Treatment

This treatment consisted of placing a 6-inch layer of dune sand on the natural subgrade. The subgrade was excavated to grade by a scraper; sand was spread to a loose depth of 7 inches and thoroughly wet before paving. This section handled easily during construction and held the paving forms to correct grade and alignment.

The dune sand used was available locally and had the following gradation:

Screen Size	Percentage Retained
No. 40	0.0
No. 270	95.6

Six-inch subsurface lateral drains were installed approximately every 300 feet to insure drainage of this course.

Limestone-Dust Treatment

This subgrade treatment consisted of a 3-inch layer of compacted earth mixed with standard commercial agricultural limestone dust. The subgrade was excavated ¾ inch below the normal subgrade elevation and scarified and disked to a depth of 3 inches. The limestone dust was added uniformly over the surface at the rate of about 125 pounds per square yard. The mixture of limestone dust and soil was then thoroughly disked, bladed, and rolled by a 10-ton roller.

Screen Analysis of Limestone Dust

Screen Size	Percentage Retained	
	Test 1	Test 2
No. 4	11.3	11.1
No. 10	46.3	32.2
No. 40	75.0	70.2
No. 270	93.8	96.0

Water-Saturation Treatment

This treatment consisted of thoroughly wetting the subgrade to a depth of 12 inches. The subgrade was scarified to this depth and ponded with water for three or four days. After ponding, 3 inches of dry dirt was added to permit equipment to shape the subgrade. During shaping operations, the subgrade was sprinkled from time to time to insure thorough saturation of the top 3 inches. Difficulty was encountered in rolling, and in setting and keeping forms to correct line and grade.

Tar (TC) Treatment

This subgrade treatment consisted of a 3-inch compacted layer of bituminous-treated subgrade soil. The subgrade was brought to shape 3 inches below normal subgrade elevation, and the excavated material placed in windrows on either shoulder. A prime coat of 0.25 gallon of tar (TC) per square yard was applied. After 24 hours, 3 inches of loose dirt was bladed uniformly over the surface and tar (TC) applied at the rate of 0.95 gallon per square yard.

After disking this material, another inch of loose dirt was spread over the surface and disked in. During disking, and before the bituminous material was applied, water was added to facilitate the mixing operation. It was necessary to add a considerable amount of water to raise the moisture content to a point where the tar would mix with the soil. After final disking the material was compacted with a 10-ton roller.

Emulsified-Asphalt (AES-1) Treatment

This subgrade treatment consisted of a 2-inch compacted layer of bituminous-treated subgrade soil. The subgrade was brought to shape by a subgrader which placed the excavated material in windrows on either shoulder. A prime coat of 0.25 gallon of emulsified asphalt (AES-1) per square yard was applied. After priming, about 2 inches of loose dirt was bladed uniformly over the surface and 0.45 gallon of AES-1 applied per square yard.

After this, another inch of loose dirt was spread over the surface, and a second application of AES-1 in the amount of 0.65 gallon per square yard was made. The material was then mixed by blading and disking. After a delay in construction, water was added and the material again mixed and rolled with a 10-ton roller.

Liquid-Asphalt (MC-1) Treatment

This subgrade treatment consisted of a 3-inch compacted layer of bituminous-treated earth. The subgrade was brought to shape 3 inches below normal subgrade elevation. The excavated material was placed in windrows on either shoulder. Then a prime coat of 0.30 gallon of MC-1 per square yard was applied. Loose dirt was bladed in from shoulders and three equal applications of MC-1 made. The mixture was disked

(*Continued on next page*)

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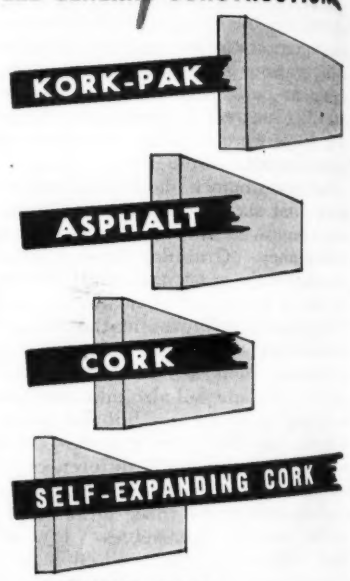

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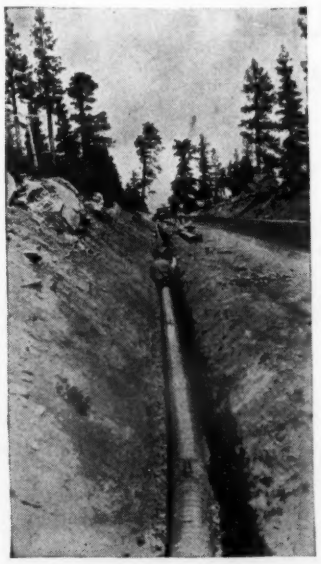

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Road Test Sections Are Now Evaluated

(Continued from preceding page)

after each application of MC-1 and compacted to a 3-inch layer. Water was added as needed to facilitate mixing and rolling. On one section, 1.5 gallons of MC-1 was used per square yard, while on another stretch, a total of 2.5 gallons of MC-1 per square yard was used. The material in both sections was compacted by a 10-ton roller.

Stabilized-Material Base Course

This subgrade treatment consisted of a 3-inch stabilized base course. The subgrade was excavated to a depth of 3 inches below normal subgrade elevation to permit placing of the stabilized material. The material used consisted of a mixture of coarse limestone and limestone fines which were batched by volumes, mixed in a concrete mixer, and discharged into spreader boxes which spread it directly on the subgrade. Water was added and the stabilized material rolled with a 10-ton roller.

A sieve analysis of the stabilized material used showed that it fell within the specifications on all sieves. The average analysis of nine tests run on the finished material is as follows:

Sieve	Percentage Retained	Specification Limits
1-inch	3.1	0-15
¾-inch	18.7	5-35
½-inch	37.9	20-70
No. 4	63.3	40-75
No. 10	73.2	60-80
No. 40	81.0	70-85
No. 270	92.5	85-93

Summary of Treatments

Type of Treatment	Material Used	Thickness in Inches	Amt. Used Per Sq. Yd.
Sand	uniform dune sand	6	.....
Limestone dust	limestone dust	3	125 lbs.
Water saturation	water	12	.....
Tar	TC	3	1.2 gals.
Emulsified asphalt	AES-1	2	1.35 gals.
Liquid asphalt	MC-1	3	1.5 and 2.5 gals.
Stabilized material	mixture of graded limestone and limestone dust	3	.....

Cost of Subgrade Treatments

As these subgrade treatments were of an experimental nature, their cost was necessarily higher than ordinary construction. No estimates of the cost of a large-scale subgrade-treatment program could be based upon them. The costs of each treatment in ascending order are as follows:

Type of Treatment	Thickness in Inches	Cost Per Square Yard
Water saturation	12	$0.10
Limestone dust	3	0.18
Stabilized material	3	0.25
Tar	3	0.27
Emulsified asphalt	2	0.29
Sand	6	0.32
Liquid asphalt (MC-1)	3	0.44

The greater cost of the liquid asphalt (MC-1) treatment in comparison with the two other bituminous treatments is due to the larger quantity used.

Riding Quality of Test Sections

In determining how to use faulting for comparison purposes in this report, all measurable faulting was considered. To compare the various sections on the basis of the number of large faults, or what can be called riding quality, a fault of over ¼ inch for any measurement at a joint was assumed to be detrimental faulting.

The average number of faults over ¼ inch in magnitude for the untreated westbound lane is 6.8 per 1,000 feet. The average number in untreated portions of the eastbound lane is 12.9 per 1,000 feet, considering only areas with silty-clay subgrade soil. This indicates the generally poorer condition of the eastbound lane.

A comparison of the number of faults over ¼ inch for the sections in the eastbound lane is as follows:

Treatment	Number of Faults Over ¼ Inch (Per 1,000 Feet)
None (silty-clay subgrade)	12.9
3-inch stabilized material	0.3
6-inch sand	0.8
None (sandy subgrade)	2.1
3-inch limestone dust	6.8
3-inch liquid asphalt—	
1.5 gallons per square yard	7.6
2.5 gallons per square yard	7.5
2-inch emulsified asphalt	8.4
3-inch tar	8.8
12-inch water saturation	18.0

This table makes apparent the relative absence of faults over ¼ inch in the sand and stabilized-material sections. The riding quality of these two sections appears to be as good today after nine years of service as it was just after construction.

In the water-saturated-subgrade section, the faults over ¼ inch are 18 per 1,000 feet or 72 per cent of all joints. This is considerably more than the untreated sections and gives an exceptionally poor riding surface.

No significant difference can be seen in the number of faults over ¼ inch on the limestone-dust and bituminous-treated sections. They average from 6.8 faults to 8.8 per 1,000 feet, as compared to 12.9 faults per 1,000 feet in the untreated portions of the lane.

In the liquid-asphalt-treated sections there is no difference in the number of faults over ¼ inch between the portion treated with 1.5 gallons of MC-1 per square yard and that portion treated with 2.5 gallons of MC-1 per square yard.

Conclusions

In all methods of analyzing the effect of the subgrade treatments on the pavement performance of U. S. 30, there are many factors and influences to

(Concluded on next page)

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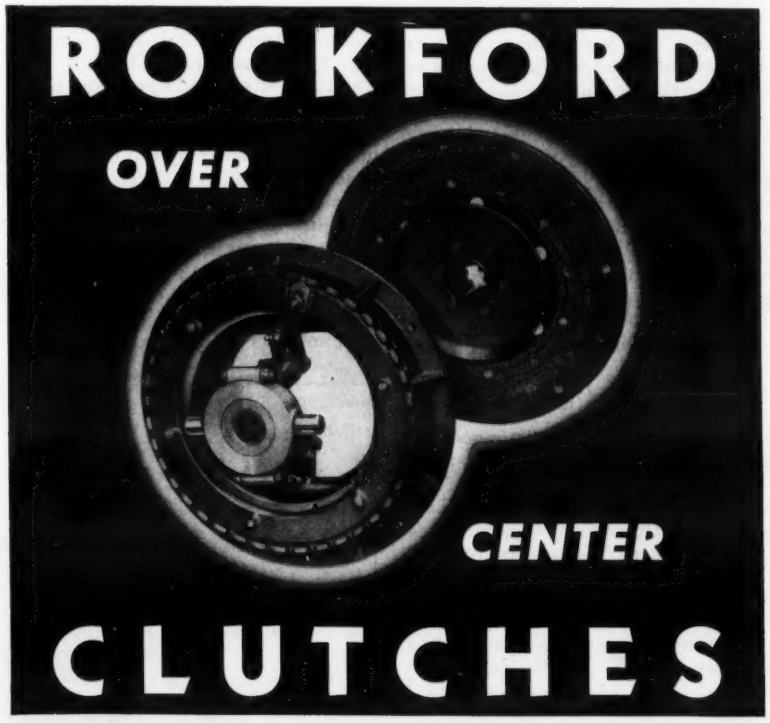

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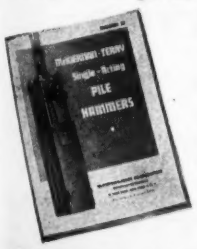

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McKiernan-Terry Bulletin No. 57 gives diagrams, specifications, operating notes, etc. Copy sent free on request.

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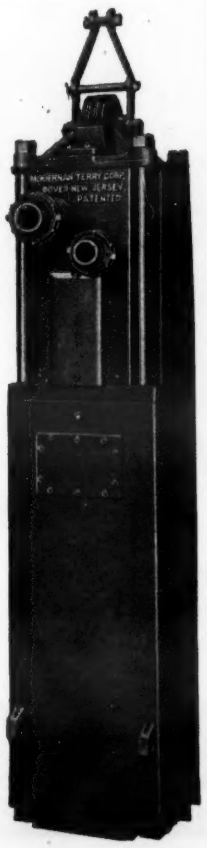

McKIERNAN-TERRY CORPORATION
Manufacturing Engineers
19 Park Row New York 7, N. Y.

Road Test Sections Are Now Evaluated

(*Continued from preceding page*)

consider. The major factors have been considered in the survey and their effects analyzed. Many minor factors that would not materially affect the results in either direction have not been considered. An overall attempt was made to show that many things influence the pavement performance, as well as to evaluate the effect of the subgrade treatments.

It is the opinion of the authors that due to the generally poorer condition of the eastbound lane of U. S. 30, all comparisons must be made on data secured in one lane only. Based on that decision, the following conclusions are drawn:

1. The results of the survey indicate that actual field installations provide an effective means for comparing or evaluating the merits of various subgrade treatments.

2. Further tests of installations constructed on a more uniform soil area would be highly advisable.

3. All subgrade treatments covered in this study, with the exception of the water-saturation, improved the performance of the concrete pavement.

4. The 6-inch sand and the 3-inch stabilized-material base courses greatly improved the performance of the pavement by preventing pumping. Where these types of treatments were used, the measurable faulting was reduced to about 25 per cent of the average measurable faulting found in untreated portions of the same lane. The number of faults over ¼ inch was reduced to about 5 per cent of the number found in untreated portions of the same lane. Of the 64 joints in the sand-base-course section, only two were faulted over ¼ inch in magnitude. Of the 87 joints in the stabilized base course, only one was faulted over ¼ inch. When longitudinal drains were installed in an attempt to minimize pumping, these were the only portions of the silty-clay soil area where it was not necessary to make such an installation.

5. The 3-inch limestone-dust treatment improved the performance of the concrete pavement by reducing both the total measurable faulting and the number of faults over ¼ inch in magnitude to about 50 per cent as much as was found in untreated portions of the same lane.

6. The bituminous treatments, including tar (TC), emulsified asphalt (AES-1), and liquid asphalt (MC-1), mixed with plastic subgrade soils, improved the performance of the concrete pavement. These treatments reduced both the total measurable faulting and the number of faults over ¼ inch in magnitude to about 65 per cent as much as was found in untreated portions of the same lane.

The thickness of bituminous treatment used in these sections may have been inadequate for the most effective improvement of the pavement performance.

No significant difference was found in pavement performance between the two sections treated with 2.5 and 1.5 gallons of liquid asphalt (MC-1) per square yard. Further studies using greater thicknesses of treatment and varying quantities of bituminous materials should be made before definite conclusions can be drawn as to the effectiveness of this method of subgrade treatment.

7. The amount of pumping and faulting in the area surveyed was found to occur almost entirely at expansion joints. No significant amount of pumping or faulting was found at cracks. No contraction joints were installed in this pavement.

8. Within the limits of this survey, more faulting was generally found in fill than in cut sections.

9. No significant difference was found between the performance of the two types of expansion joints used.

10. From observations since their installation in 1944, it appears that the longitudinal drains are in some measure effective in controlling pumping.

11. Aerial strip maps are an effective means of evaluating concrete-pavement performance.

Scrap Urgently Needed

The next 60 to 90 days are expected to be critical ones to the iron and steel industry, unless a concerted effort is made by contractors and other equipment users to get their scrap to steel mills and foundries. The normal cycle of scrap flow has been so interrupted that a severe shortage is threatened unless scrap is turned in promptly.

Under normal conditions, scrap iron will find its way back to the mills in from 7 to 10 years. However, because of the war, much of the normal supply has been irretrievably lost. In addition, old equipment models have not been scrapped in any volume because of the shortage of new equipment. And wartime salvage drives have already depleted much of the normal supply.

Ordinarily, new steel and new castings contain from 50 to 65 per cent scrap iron. By using scrap, which is iron or steel that has already been refined, the production process is shortened and the price of the new goods is lowered. It is interesting to note that due to wartime expansion, the capacities of existing blast furnaces are considered adequate to meet normal requirements, if adequate materials are available.

This scrap drive will benefit all contractors and other equipment users, and has the backing of national groups and manufacturers. A full-scale campaign has been undertaken by the Allis-Chalmers Mfg. Co., in an effort to meet the very critical situation. A special 16-page booklet describing the shortage has been prepared by the company and is now being given national distribution. In addition, the Allis-Chalmers advertising for April and May will carry strong pleas on behalf of the campaign. And arrangements were made to have The National Farm and Home Hour NBC radio show devote several spot announcements to the scrap drive.

Freight-Car Outlook

At present, the freight-car-shortage outlook is still dim, said W. C. Griffin, District Manager, Car Service Division, Association of American Railroads, speaking before the National Sand & Gravel Association in Los Angeles. However, he indicated that there is some hope and encouragement. It lies in the recently increased allotment of steel for freight-car repairs. This, he said, should make possible a further reduction in the 3.8 per cent of equipment which is now awaiting rehabilitation.

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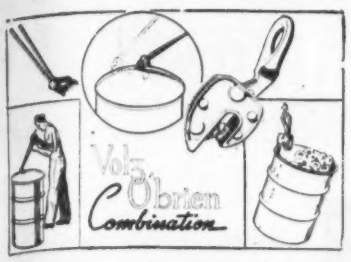

Steel drums or barrels can be made into handy easily moved containers by the use of the O'Brien cutter and the Volz lifting clamp.

Tote-Box Converters

Steel barrels or kegs are said to be convertible to tote boxes for storing or conveying small parts or loose material by means of two tools made by Merrill Brothers, 56-04 Arnold Ave., Maspeth, N. Y.

First, the top of the drum is removed with the O'Brien steel-drum cutter, a tool which works on the principle of the standard kitchen rotary can opener. Then, by means of the Volz double-action forged clamp, these cut-away-top barrels are lifted and conveyed wherever wanted. The clamps work automatically and grip as soon as pressure is applied; they release when the pressure is removed.

Further information may be secured from the company, or by using the enclosed Request Card. Circle No. 5.

Rock-Crusher Data

The line of rock crushing and related equipment made by the Gruendler Crusher & Pulverizer Co., 2515-19 No. Market St., St. Louis 6, Mo., is illustrated and described in a bulletin now available. Bulletin BR-200, entitled "Better Ways to Increase Plant Capacity", shows and describes the salient features of Gruendler jaw crushers, hammermills, roll crushers, feeders, and screens. Also included are pictures of typical installations, showing bins, conveyors, portable trucks, and a complete plant layout.

In addition to this bulletin, Gruendler will send, upon request, other bulletins on any of its equipment, covering each item in detail. The company also maintains an engineering service to help plan the best plant for each case, to insure maximum production.

Copies of this literature may be obtained from the company. Or use the enclosed Red Request Card. Circle No. 77.

New Concrete Cart Has Dump-Over Body

A dump-over type of concrete cart has been put on the market by the W. E. Grace Mfg. Co., 6000 So. Lamar St., Dallas 1, Texas. The cart is built in such a way that when it is dumping, the wheels and axle stay on the ground; this saves effort on the part of the operator, it is said. When desired, the axle may be locked to the body.

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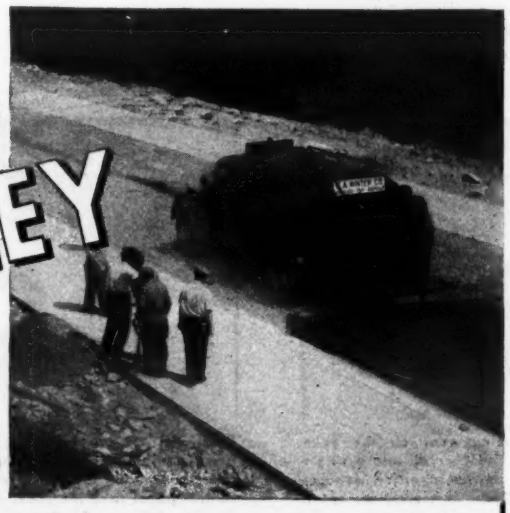

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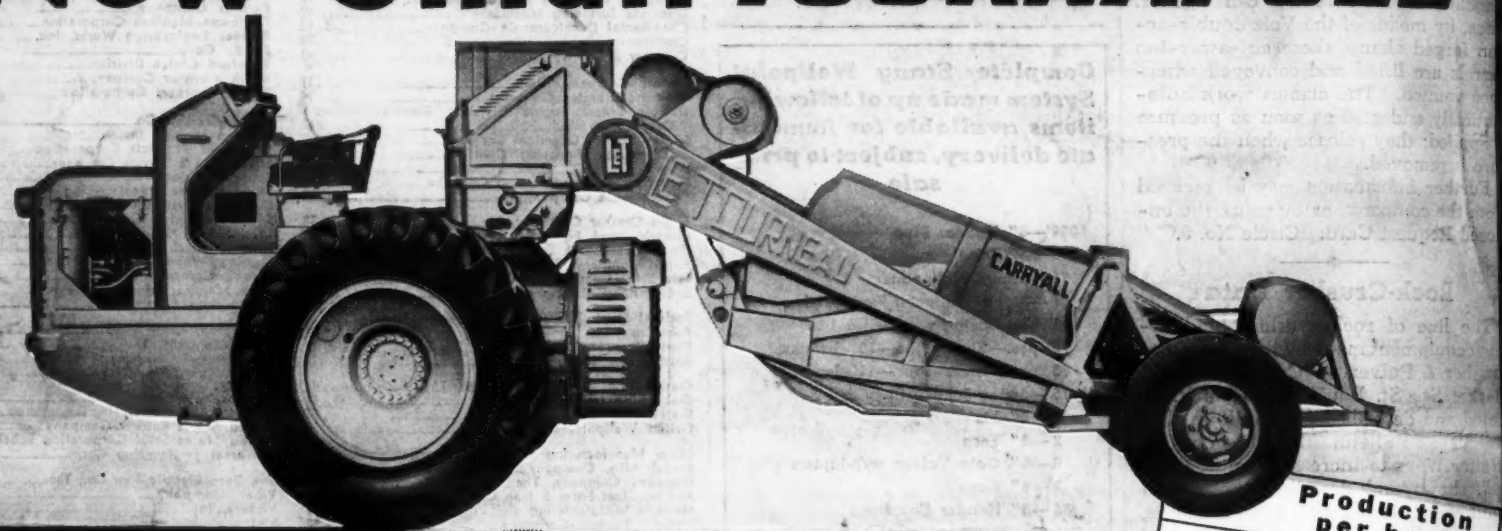
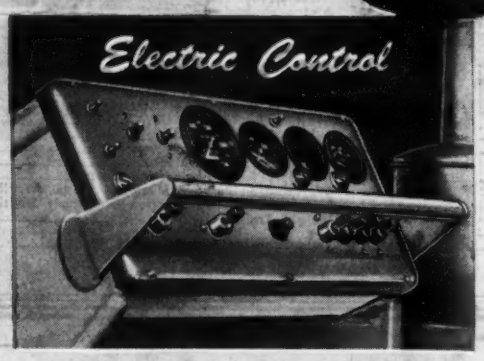
ONE-MAN DIRTMOVER

New Small TOURNAPULL





Bowl, apron, tailgate and steering controlled by Tournatorque electric motors. Each operation finger-tip controlled from dashboard. The Tournatorque electric motor is a new type of AC motor with the lugging characteristics of DC motors. Tournatorque electric motors and generators are simpler in operation and maintenance than the electric starter on your car or truck.

LET Clears slides; fills washouts; loads, hauls and spreads surfacing; strips and works gravel pits; digs stockponds; fills lots; levels building sites; grades and surfaces driveways or access roads; builds small dams or levees. Travels fast over pavements or cross country . . . no trailer or haul equipment needed. Continuous mesh Tournamatic transmission . . . no delay for shifting gears. Fills tank at any filling station.

Self loading
3.3 yards struck
85 h. p. gasoline engine
Tires {14:00x32 PRIMEMOVER / 9:00x16 ON CARRYALL
Weighs 7½ tons empty

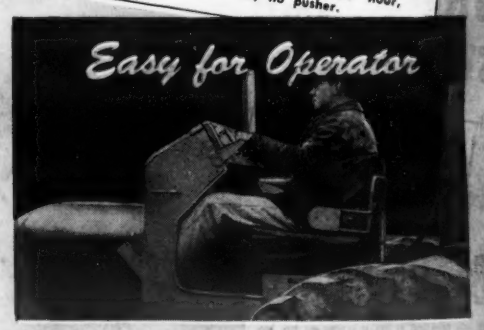
Production per hour

One-way haul	Yards per hour
200′	48
400′	45
600′	42
800′	40
1000′	38
1500′	33
2000′	30
2500′	27
3000′	24
4000′	21
5000′	18

Above production figures based on average type scraper material, fairly level haul, good working conditions. Figures show production for 60-minute hour, one-man operation, no pusher.

This new Tournapull hauls through loose sand, mud, snow or ice that would stall any previous wheeled vehicle. The revolutionary Tournamatic differential is so designed to make one wheel pull 4 times harder than the other before it will slip. Most power is automatically supplied to the wheel on firmest footing.

Electric motor operates a steering gear on the yoke king-pin. This locks Tournapull and Carryall into a single unit and keeps rig traveling in desired direction, regardless of underfoot conditions. Operator merely pushes a button to turn . . . Tournapull continues on same course until operator again pushes control button for right or left turn. Selective 2-speed steering gives positive control.



Electric control, power steer, positive traction make the new Tournapulls easy for the operator. Finger-tip controls for steering and all Scraper operation from a single control panel take the labor out of operating . . . reduce operator fatigue. Comfortable spring-cushioned seat, plus shock-absorbing rubber tires are a few more reasons why operators like the new Tournapulls.

LETOURNEAU
PEORIA, ILLINOIS

JOB-PROVED Over 5000 Built and Shipped

TOURNAPULLS

Tournapull, Carryall—Trade Mark Reg. U. S. Pat. Off.